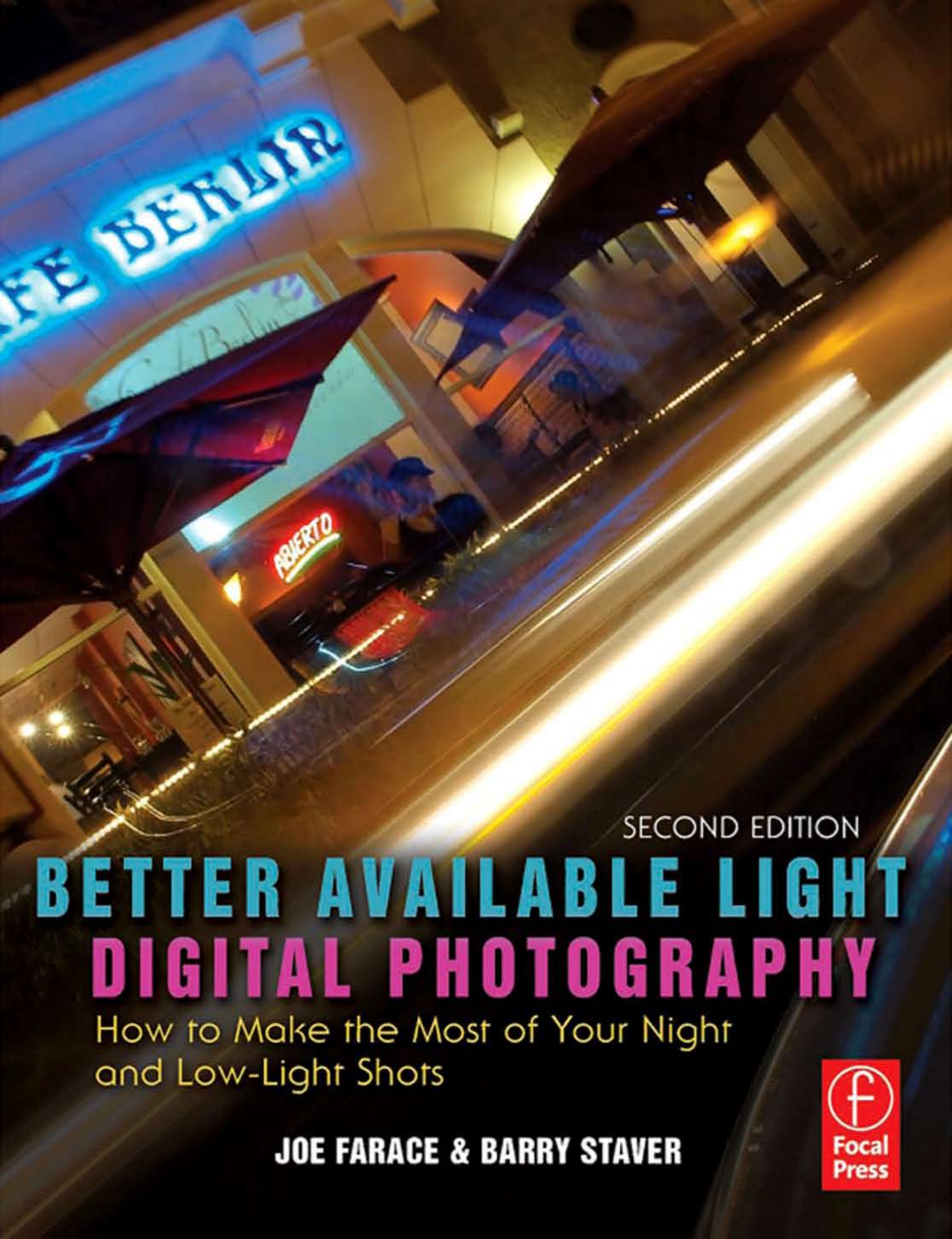

SECOND EDITION

BETTER AVAILABLE LIGHT DIGITAL PHOTOGRAPHY

How to Make the Most of Your Night and Low-Light Shots

JOE FARACE & BARRY STAVER

Focal Press

VISIT…

Better Available Light Digital Photography

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Better Available Light Digital Photography

How to Make the Most of Your Night and Low-Light Shots

Second Edition

Joe Farace
Barry Staver

ELSEVIER

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Introduction

When making photographs, never forget the "Gasp Factor."

—Dick Stolley, former Time-Life managing editor

When learning and refining their skills, most photographers progress through three distinct phases. The first stage occurs immediately after they get their first "good" camera and begin discovering the potential of the medium. During this time, novice shooters photographically explore their world with a high level of enthusiasm. Every new batch of images they examine contains photographs that look much better than the photographer ever imagined they could. Unfortunately, this blissful period doesn't last long and is quickly replaced by the next period.

In phase two, the shooter's level of enthusiasm is still high, but is diminished when reviewing his or her newest captures only to discover that they are much *worse* than expected. As photographers continue to improve their skills by reading publications such as *Digital Photographer* and *Shutterbug*, attending workshops and seminars, and practicing their art, they eventually reach the final phase.

At this level, the image that photographers see in their camera's viewfinder is exactly the same thing that appears on the camera's LCD screen or computer monitor. Although reaching this phase can be fulfilling, some of the magic is gone. If you would like to experience some of the same thrill of discovery that occurred during the first phase of your photographic education, we would like to suggest that you photograph when the available light may not be so available.

The "Gasp Factor"

When you turn the pages of magazines, books, and newspapers, do you ever notice how some images just *grab* you? These great photographs are unique; they are different. They literally force you to stop and take a second look at them. When confronted by this kind of photograph, do you sometimes wonder, "How was that taken?" Perhaps you just think, "*I wish I could do that.*" The goal of this book is to answer both the question and the wish. We will take you behind the scenes and show you how many different kinds of available light photographs were made

and in the telling we hope to help you improve the photographs you make using available light.

Dick Stolley, who was by many reports the best managing editor at Time-Life, once told *People* magazine's contributing photographers that a successful photograph elicited a "Gasp Factor" from the viewer. These photographs can literally take your breath away. They tug at your heart or hit you in the gut, stirring emotions of joy, love, hate, sadness, or anger. Take a few minutes to visualize one or more of the iconic images in our recent history: flag raising at Iwo Jima, the *Hindenburg* explosion, sailor kissing a nurse in Times Square as World War II ended, Lee Harvey Oswald being shot by Jack Ruby, John Kennedy, Jr., saluting at his father's funeral, the handgun execution in Saigon, or one of the Twin Towers in mid-collapse. Specifically, recall in your mind's eye any Pulitzer Prize–winning photograph. These images stop us in our tracks as we react on an emotional level to their content. The reaction to most Pulitzers is usually on the serious side of the spectrum—anger and sadness—because it's often the nature of the news business. Is it possible to get these kinds of emotional reactions to our everyday photography? You bet it is! Our premise is that the proper use of lighting is one of the main ingredients to successful, eye-catching photography. In this book, we'll show you how to improve your use of lighting.

Mr. Stolley went on to say that if the image stopped the reader, forced them to take a second look at it, to read the story's headline and then perhaps the rest of the story, the photograph passed his "Gasp Factor" test. After all, the goal at all publications is getting people to read the content and Stolley believed that the process was led by great photography. Our goal is simplified, because we're not writing headlines and stories, just wanting our images to rise above the overcrowded snapshot maze. Often the best photographs—the "Gasp Factor" ones—are taken under less than ideal conditions. These images are made on dark, cloudy, stormy days; at the crack of dawn; at sunset; or in the dark of the night.

Available light, unavailable light, available darkness, or low light—it doesn't matter what you call it, but the truth is that the most rewarding photographs can be produced when you are working under the most challenging lighting conditions. There are several reasons for this.

First, there is the thrill of overcoming the technical obstacles that might normally prevent you from producing a well-exposed image.

Second, photographs made under conditions different from the "f/16 and the sun over your right shoulder" instruction-sheet standard have a more eye-catching look.

Third, because most photographs are made during the middle of the day, taking the time to search out other than "normal" lighting conditions, such as those that exist just after dawn or before sunset, will produce photographs that will make yours look truly different from the rest of the pack's.

This one's for you

Early or late in the day, the sun can be at extremely low angles to the horizon and produce dramatic moody shadows and an interplay of light—effects that are lost when the sun is directly overhead. Just as challenging can be the prospect of working indoors under a combination of—or lack of—different kinds of light sources. *Better Available Light Digital Photography* is your practical guide to understanding the many different kinds of lighting challenges that you may encounter. It has been written to provide some answers to questions of how to overcome the kind of challenges you may encounter while creating great-looking photographs.

Better Available Light Digital Photography is written for the amateur or aspiring professional photographer who has been frustrated trying to create useful images under less than optimum conditions. If you've tried to photograph indoor sports, special events (such as plays, weddings, graduations, and dance recitals), holiday lights, outdoor events at dusk or later (including fireworks), you know it can be a difficult process. If you have been frustrated by your experiences, the tips, tools, and techniques the authors will share with you will help improve all your available light and low-light photographs.

You may be surprised to learn that you already own most of the equipment for successful low-light photography. In addition to camera and lenses, you will need a tripod or some other kind of camera support, an umbrella or poncho to stay dry, plastic bags to protect the equipment, a pair of long johns for winter photography, and the adventurous spirit to try something new. As you begin your own adventures in available light photography, you will quickly discover that the rewards far outweigh the inconveniences.

The information about which camera, lens, and exposure was used for each photograph should be viewed as a guide to the *class* of equipment you will need to re-create our results. If any special equipment was required, we will tell you what it is, how we used it, and direct you to a Web site where you can find it.

Keep in mind that the brands of cameras and equipment that we use are a *personal* choice. To produce images similar to what you'll see in these pages, you don't need to use the exact gear

that we used. The photo gear that we use is based on our preferences, so *vive la différence* and use whatever brand of equipment you prefer.

It's all about the photographs

After reading a few pages, it will quickly become apparent that this is a different kind of photography book from any you have read before. Sure, we include the kind of photographic tips, tools, and techniques that enable you to create better available light images, but there is much more. For example, almost all of the images you will see were made on assignment for commercial clients, magazines, and newspapers. Although a few were made for our personal use, most were captured under the real-life demands of deadlines and clients in a hurry to get their photographs.

What we have tried to do in these pages is take you behind the scenes at this kind of assignment—to "walk a mile in our moccasins," if you will, to see what it is like to create images under demanding lighting conditions. The point to all of these inside stories is to let you know that *all* photographic situations—especially those occurring in low-light conditions—are unique. Showing you how we solved some of these problems, often with little time to think about anything but how to get the shot quickly, gives you the benefit of our experience standing in wet boots with cold fingers, and sometimes runny noses, to get the emotion-packed shot.

This book is about the *adventure* of photography. It is about being passionate in creating images that reflect your view of the world, not the re-creation of someone else's ideas. Our challenge to you is that you, too, will sometimes have to brave the elements to produce great images. Are you ready to take your camera out of its case in the rain and snow to get up in the middle of the night to prepare for the sunrise? Will you miss dinner for a beautiful sunset? Would you sacrifice a good night's sleep for a shot in the dark? Are you ready to try handholding your camera for an exposure of 1/8 or 1/4 of a second? Will you shiver with us on a cold winter's night? Are you willing to capture images when your in-camera meter or LCD screen screams "Underexposed"? If you answered yes to all of these questions, then this book is for you. In the pages that follow, we will guide you through the all of the steps necessary to produce some of the most exciting images you've ever taken in your life.

What's new

The biggest difference between this version and the previous one is that this will be *all digital*. Did we mention the instant gratification that's now possible? Therefore, the new edition

will cover topics not included in the first edition, including how to deal with white balance, digital noise, and understanding and using the histogram. In addition to describing how these affect digital capture under low-light conditions, we'll show you how to overcome these problems to produce the highest possible quality images, including the use of RAW capture.

As before, the images will be case-study based, showing photographs made for clients and in real-world assignments, when the shot had to be right the first time. Often this means overcoming all kinds of logistical, weather-related, and physical problems, notwithstanding the photographic challenges of making images under conditions when most people would just give up. That's when Joe and Barry dig in and get the shot. This book tells the story of many such assignments.

Barry Staver & Joe Farace
Denver, 2008

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1 What is available light?

A kind of golden hour one remembers for a lifetime . . . Everything was touched with magic.

—Margaret Bourke-White

It is 3 a.m. and a clanging alarm clock jolts you into semiconsciousness. It's pitch-black outside; last night's storm has subsided, but it's still 5 degrees below zero. Ten inches of fresh snow covers the countryside. No other creatures are stirring, yet you are planning on going out in this weather to make photographs. To be comfortable outside, you will need to put on every warm piece of clothing you own (long johns, wool socks, heavy boots, layers of shirts and pants, gloves, perhaps a scarf, and a hat with earflaps), brush snow from the car, scrape ice off its windshield, and drive 50 miles on as-yet-unplowed roads. It's still 5 below when you arrive at your destination and you may have to hike to the spot you've selected, set up a tripod in the dark, mount the camera, and wait—for what?

Although the early bird usually gets the worm, the key word here is ***usually***. This is what it looked like one early March morning—hey, it's Colorado—when Joe looked out his window. There wasn't going to be a ***Golden Hour*** today, and that happens as many times as it doesn't happen. So don't be disappointed when you make the effort to get up early and Mother Nature doesn't cooperate. The time will come when she does and that will make up for grim mornings like this one! © 2003 Joe Farace.

The Golden Hour

You will be waiting for the first rays of morning light to illuminate the sky; waiting for the warm glow of dawn to flood across the landscape. What you are waiting for is *the Golden Hour*—those precious fleeting minutes when the quality of light provides photographers with images that truly separate photographs from mere snapshots. Is it worth the wait? You'd better believe it is.

A sunset can happen rather quickly, so it's important to have most of your work done in advance. You should already know which ISO setting and lenses you are planning to use. In order to do this, Barry suggests that you should have also previously scouted the location and determined the best spot to place your camera; but Joe confesses to being more of a "shoot and scoot"

In the first edition of this book, the first image was "Mexican Sunset" by Barry Staver, and was shot using Kodachrome 64 film. This photograph of a beach in Acapulco is a composite of ***two*** images captured with a Canon 1D Mark II at ISO 800 and combined using the Photomerge command in Adobe Photoshop (File > Automate > Photomerge) to create a panoramic photograph. The handheld exposure for both images was 1/200 sec at f/10 and set in Aperture Priority mode. © 2005 Joe Farace.

photographer. His "Mexican Sunset" image was made on his way to dinner; so another rule to follow is to be sure to bring your camera with you—everywhere. Ask yourself a few questions: Do you have a foreground object or landmark to add some interest? Joe's photo, alas, does not, and relies on the image's color to carry the photograph. Doing your planning *before the Golden Hour* arrives leaves you free to concentrate on the proper exposure for the scene as the sun drops (and it does change fast), and framing the image properly.

We have all marveled at the beautiful colors in the sky and snapped blindly away—only to find that the photograph did not meet our expectations. Too often in these photographs, there is no subject in the foreground, or unwanted obstacles appear that you didn't notice when you snapped the shutter. (Have you ever had a telephone pole sticking up behind someone's head? Where did that come from?) Once a photographer masters the technical aspects of shooting the low-angled sun, then the content of the picture must be planned in order to create a sunrise or sunset image that is brimming with interest and vitality.

While on a trip to Acapulco, Joe carried a Leica D-Lux 2 with him almost all the time, and this image proves that that you can also make interesting sunset images with point-and-shoot digital cameras. The D-Lux 2 lets you capture images at 16:9 ratio, so this is the full, uncropped image that he made of the beach. Like many similar cameras, this was made in one of the Scene modes that the camera offers (Landscape). © 2005 Joe Farace.

When will the sun set in your photographs? In a broad sense, it depends on your locale in relation to the equator and the season of the year. Northern latitudes have very long summer days, with resulting sunsets that are later—almost approaching night. The opposite occurs in winter. The sunset will appear in the southern sky during winter months, shifting north as spring and summer arrive. More exact data can come from the weather section of your local newspaper, which usually gives the precise times for the sun's rise and fall each day. You can also find precise information from the U.S. Naval Observatory Web site (http://aa.usno.navy.mil/data/docs/RS_OneYear.php). It's also possible to visualize the sun's setting point by watching it move during the late afternoon. You can get close by watching the horizon brighten in predawn. The sunrise is harder to pinpoint this way, but it obviously gets brighter at a spot where the sun actually crests the horizon.

All sunsets are different, and although some produce great warm colors, others produce just lots of contrast. While Joe was walking on the beach at Acapulco, he saw this family playing in the sand at sunset. Using a Leica D-Lux, he shot several variations of this scene. The best foreground interest in a sunset shot is usually people. © 2005 Joe Farace.

Here are two examples of the way nature can be used as your foreground interest. Part of Barry's preparation to teach a photography workshop for ***Shutterbug*** magazine at Arches National Park included arriving a day early to physically scout out good locations for the class to visit and photograph. Everyone's heard about those "lucky shots" but we believe that we make our own luck. In this case, the luck was simply Barry's scouting the day before and his willingness to visit the park in the wee hours before the workshop began. He'd seen Balanced Rock and knew it was the perfect rock formation for a sunrise silhouette. He was able to move quickly between two locations, using two different lenses—an extreme wide angle for the tree branch foreground and a telephoto for the tighter shot of the rock itself. Look for a third image of this well-known rock formation in Chapter 6. © 2007 Barry Staver.

Zap!

Photographing the elements can be a humbling experience. Mother Nature unleashes incredible power, dwarfing mankind with her fury. If you've ever been caught in a heavy cloudburst, a fierce windstorm, hailstorm, near a hurricane, in a blizzard, or in a thunderstorm with deadly lightning striking around you, you know that feeling. In cases like this, there is nothing you can do except wait it out. Well, you could be taking photographs while you wait.

Weather tips from Barry

The elements provide the backdrop and subject matter for many incredible photographs. To capture these images, a photographer must be willing to uncover his or her precious camera and risk getting it wet. Don't worry—your camera can take it. Most modern digital SLRs are well sealed and modest rain or snowfall won't penetrate their interiors. Of course, you will need to take some precaution to cover your camera between exposures. Tuck it inside your coat. Put a plastic bag over it or put it back inside your (hopefully) waterproof camera bag. Under these conditions, you won't melt and neither will your camera. Joe collects the shower caps that are thoughtfully provided by hotels and keeps a few in his camera bag to cover his camera when working in the rain.

Photographing in the rain is a challenge. You can hold an umbrella or do what Joe did when photographing these Japanese students—get wet. He was also indulging his propensity for film homage, and in this case it's Alfred Hitchcock's ***Foreign Correspondent.*** Exposure was 1/50 sec at f/5.6 and ISO 1600. Lens was a Canon EF 100–300 mm zoom at 195 mm. © 2005 Joe Farace.

Most lightning shots are made from afar, so a cityscape or landscape can be included as a framing device for the composition. The distance provides safety, and the city in the foreground and background can produce a dramatic photograph. A typical

summer day in Denver begins with blue sky, warm to hot temperatures shifting to a stormy afternoon. Weather in the form of dark, ominous clouds often rolls in from the Rocky Mountains west of the city. In less than 30 minutes, a nice day can become a dark, stormy one, followed by clearing, a beautiful sunset, and a pleasant evening. Nevertheless, you don't want to be exposed during a lightning storm. According to the National Oceanic and Atmospheric Administration (NOAA), lightning kills 90 people every year in the United States.

Light is light

It doesn't matter what person, place, or thing you are photographing—the ultimate subject of any photograph is light. Light, whether it occurs naturally or artificially, has three basic characteristics: quality, quantity, and color. The quality of the light on a subject ultimately determines the effectiveness of your photograph. That's why we will spend lots of time taking you behind specific photo shoots, describing the conditions under which the images were made. These descriptions of the aesthetic decisions that were made are designed to help you literally "see the light" so that you can benefit from our experience, but the best way to learn how to learn to see light is to shoot pictures and examine the success and failure of each photograph vis-à-vis the way you handled light in the final image.

If light is the main ingredient in a photograph, then the quality of the light becomes the driving force in producing successful

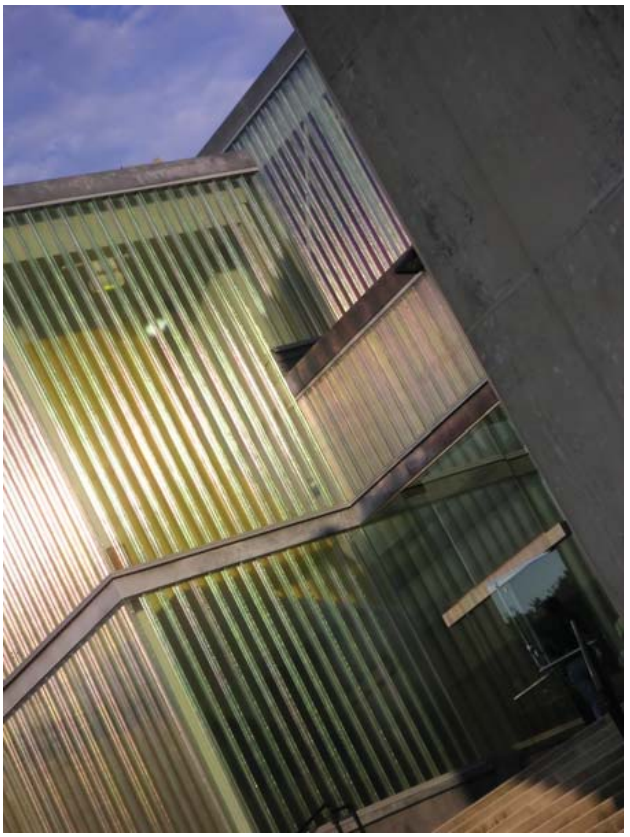
Light on overcast or hazy-schmazy days is flat and cool. This photograph made from the balustrade of Fuerte San Diego in Acapulco features the kinds of sights the Convention and Visitors Bureau doesn't use on their travel brochures, but shows much of the life and vitality of the city. Even under dull, boring light, the bright colors of this wonderfully vibrant city seem alive. Image was captured with a Canon EOS-1D Mark II with an exposure of 1/125 at f/7.1 and ISO 200. © 2005 Joe Farace.

images. To gain some understanding about light, let's get some scientific stuff out of the way first. As you know, the earth's complete rotation every 24 hours provides us with day and night. Our planet, with its slightly tilted axis, revolves around the sun every 365 days producing not only seasons, but also lengths of day and night. That is where those long, lazy days of summer come from, as well as winter's shorter days. It's also why the far northern latitudes receive almost total daylight in summer and near-complete darkness in winter.

Knowledge of atmospheric conditions is essential to your understanding of light and *the Golden Hour*. Did you know that air pollution from industrial sites, automobiles, forest fires, and even volcanic activity affect the quality of light? Particulates in the air produced by these sources diffuse and scatter light rays. The haze in a Los Angeles Basin sunset produces a different quality of light than does the same sunset taken on a remote

The early-morning light filtering through the trees in this apple orchard provides the first ingredient for a successful photograph. The second ingredient is simply how that light is used. It's coming in from the left side. This side lighting not only illuminates the trees, but casts the marvelous shadows across the ground and the mottled pattern on the worker's face and arm. The third ingredient is the positioning of the subject and the ladders. No setup or posing was done; the photograph is totally spontaneous and candid. The light provides mood and depth; the subjects add composition and supplement the depth. © 2006 Barry Staver.

beach in the Hawaiian Islands. Areas near Mount St. Helens and Yellowstone National Park had their sunrises and sunsets obliterated during the eruption and massive fires, yet photographers thousands of miles away had intense colors added to their low-light experiences.



This photograph of the Fine Arts Center on the campus of the University of Massachusetts at Amherst was made at dusk using a Minolta DiMAGE X point-and-shoot camera. Exposure was 1/500 sec at f/3.5 at ISO 50 in straight Point-and-Shoot mode, proving you can use a simple digital camera to make low-light photographs. © 2003 Joe Farace.

This third aspect of light deals with the color temperature emitted by our light sources and is measured in degrees on the Kelvin scale. To successfully create low-light photographs, a basic understanding of the color temperature of light is necessary. The sun on a clear day at noon measures 5500 K. On a thick, overcast day, the color temperature of light rises to 6700 K. You will experience 9000 K in open shade on a clear day. These higher temperatures are at the cool, or blue, end of the spectrum. On the lower side, however, light sources are at the warmer end of the spectrum.

Lights used by videographers or tungsten-type lights have a Kelvin temperature of 3200. Household lightbulbs are close to that color temperature, measuring about 2600. When we photograph that special sunrise, its color temperature may be well down on the Kelvin scale, at about 1800. As you can see, the photographic process not only demands a certain amount of light

to register an image onto a digital sensor, but also an understanding of atmospheric conditions and the color temperature of light. To deal with light that's anything but typical, digital SLRs include various built-in White Balance settings so you can compensate for these differences. How to use these different White Balance settings is covered in Chapter 4.

Most of us equate daylight with the proper time for making photographic exposures and that's why many photographic opportunities at night or late in the day are often overlooked. They shouldn't be, but all daylight is not the same. Most people look at *the Golden Hour* and see the beauty of the subject, no more and no less. You will hear comments such as, "The sunrise was just beautiful," or, "Look at the golden glow in that portrait," and maybe, "What a romantic sunset." As photographers working in low light, we need to know more about the nature of light so we can capture light that others merely glance at.

Barry's son Michael Staver travels a great deal and takes full advantage of the opportunity to create eye-catching photographs. It would seem unlikely to find a unique perspective or angle to photograph one of America's best-known icons—the Statue of Liberty—but here is Michael's take. Most people snap away as the ferry passes in front of Lady Liberty, or they stand at the base, pointing cameras upward. People think she needs full sunlight on her as well. Michael broke with all of these traditions as he took this photograph from the pier, waiting in line for the ferry ride out to the island. The main focus point is the pylon with birds on top, as you can see, with the statue in the background. He didn't have the luxury to wait for a sunny day, so the clouds and rough water combine to give us a different view. In fact, this image is even stronger when converted to black and white (see Chapter 8 for more on this topic). © 2007 Michael Staver.

Keeping a camera handy is always a good rule because you don't know when a rainstorm will produce a rainbow. Joe had a Fuji FinePix 4800 Zoom camera handy when this double rainbow appeared in his neighborhood near the end of the day. He really liked the color of the light and the two rainbows, even though the second one was faint. He grabbed the camera, put it in Program mode, and made a series of 10 to 12 shots before the rainbows were gone. The camera's EXIF data recorded an exposure of 1/80 sec at f/2.8 at ISO 125. © 2001 Joe Farace.

What is EXIF and what is it good for?

The Exchangeable Image File standard was established in 1995 as a way to accommodate a range of image file formats and allow playback of photos made with one kind of camera to be played and viewed on other devices. As such, EXIF is part of Design rule for Camera File system (DCF), a larger file system standard designed to ensure image file compatibility between digital cameras and printers. DCF-compatible devices allow image files to be easily exchanged so that photographs made with a Canon PowerShot SD40 can be viewed on a Nikon Coolpix S7c's LCD screen.

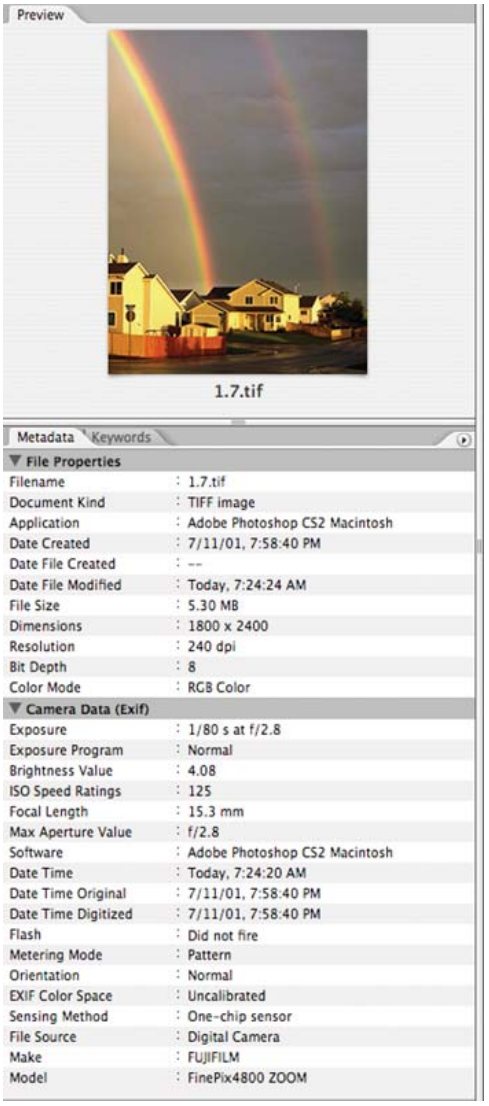
This EXIF standard is the file format used by most digital cameras and defines filename standards and folder structures, including how to store image and camera data. When a digicam is set to capture and record a JPEG image file (named after the Joint Photographic Experts Group), it's actually recording an EXIF file using compression to store additional photo data within that file. This information can expand to make room for future applications, enabling users to add new information along with new camera features as the state of the art progresses.

Right now, EXIF supports storage of extended camera information within the image file's header, such as the time and date the image was made, device name, shutter speed, and aperture, along with other capture data such as compression mode, color space, and number of pixels. You can read all of this header information externally using EXIF-compatible software, which can use it for image file management (the subject in the fourth part of this quadrilogy).

In addition to image data, the next most important feature of EXIF is its inclusion of *thumbnails*. Thumbnails are small versions of the original image and can be used by software applications including image-management software and image-editing software to display a series of image files. Under DCF standards, the typical thumbnail size measures 160×120 pixels.

Together with the image data, the EXIF 2.2 standard—a.k.a. EXIF Print—records all of the information set by the photographer, including capture parameters and scene information, in the form of EXIF tags. The printer reads all of this photographic information to ensure optimal printing. This can be especially important when capturing an image using a digicam's Scene modes. Photographic scene information, for example, records that the image was captured in Night Scene mode and printing is optimized to suit the original effect without increasing image brightness. Consequently, the output produced will faithfully reflect the photographer's original intentions.

Image-editing programs such as Adobe Photoshop make use of EXIF data to display thumbnails in the program's Bridge image-management module. Clicking on a thumbnail in Photoshop Elements also allows you to view all of the specific EXIF camera data associated with that specific photograph. Many other image-editing programs also let you view EXIF data so you can read specific details of how an image was captured, unlike when using film, when you had to use a pen and paper! © 2007 Joe Farace.


Preview
1.7.tif
Metadata
Keywords
File Properties
Filename : 1.7.tif
Document Kind : TIFF image
Application : Adobe Photoshop CS2 Macintosh
Date Created : 7/11/01, 7:58:40 PM
Date File Created : --
Date File Modified : Today, 7:24:24 AM
File Size : 5.30 MB
Dimensions : 1800 x 2400
Resolution : 240 dpi
Bit Depth : 8
Color Mode : RGB Color
Camera Data (Exif)
Exposure : 1/80 s at f/2.8
Exposure Program : Normal
Brightness Value : 4.08
ISO Speed Ratings : 125
Focal Length : 15.3 mm
Max Aperture Value : f/2.8
Software : Adobe Photoshop CS2 Macintosh
Date Time : Today, 7:24:20 AM
Date Time Original : 7/11/01, 7:58:40 PM
Date Time Digitized : 7/11/01, 7:58:40 PM
Flash : Did not fire
Metering Mode : Pattern
Orientation : Normal
EXIF Color Space : Uncalibrated
Sensing Method : One-chip sensor
File Source : Digital Camera
Make : FUJIFILM
Model : FinePix4800 ZOOM

One of the differences between the current version of EXIF and previous ones is the *color space* that used. Color space describes the range of reproducible colors that a camera can see, a printer will print, or a monitor can display. Monitors, for example, use sRGB (Standard RGB) color space and colors are limited to reproduction within this range. Some digital cameras, however, use the sYCC color space, which allows a wider range of colors to be recorded and reproduced than does sRGB.

Long used in the video world and in Kodak's original Photo CD format, YCC represents the familiar Red, Green, and Blue (RGB) channels as a luminance (Y) and two color-difference channels,

If shooting in one of the many Scene modes available with digital cameras these days, the latest version of EXIF (2.2) makes sure that when an image made under different kinds of lighting conditions is printed, such as this night scene, it's also printed correctly. © 2005 Joe Farace.

Cr and Cb (Cr is chrominance red; Cb is chrominance blue), with the green being handled by the luminance component. A variation on this color space called LAB has been available in Photoshop for some time, but sYCC is simply YCC created from sRGB color space.

Why do you care? Previously, when sYCC images captured with digital cameras were transferred to a computer, all of the monitor colors outside the sRGB range would be discarded, or clipped. Clipping is the loss of image information in a region of a photograph that is brighter than the imaging device can handle, or that is outside the color gamut of the space used to represent the photograph. EXIF 2.2 allows more-accurate image processing because handling sYCC images using compatible applications and printers means that virtually all of the original image captured by the digital camera can be accurately printed. More color represented more accurately is better, right? Right. You'll find additional information about color space in Chapter 4.

Artificial light

Wait, isn't the title of this book *Available Light*? Well, yes, but not all available light is from the sun or other natural sources. Available light is the light you have around you and the art is

making your camera see like you can, or even better than you can. Taking pictures without blasting your subject with direct flash defines Available Light Photography. And that light can include flash bounced off a wall, sunlight reflected from a pool, monocolor light buzzed from a neon tube, the hot blue light of a welding torch, or a simple desk lamp.

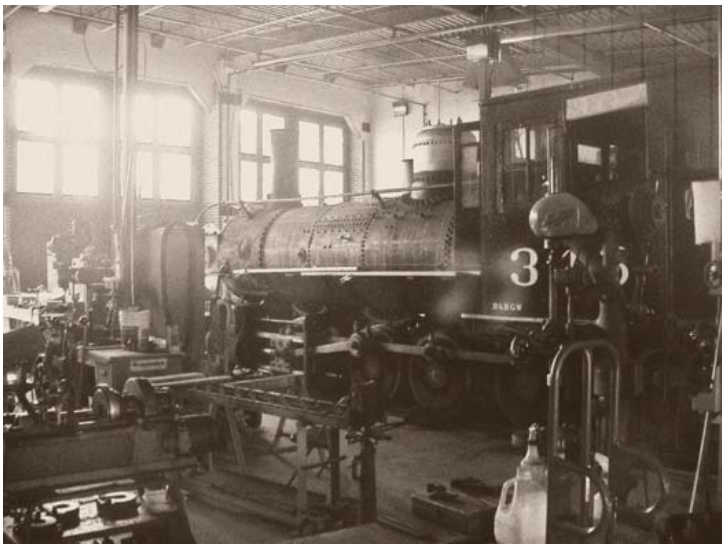
The quantity of light dictates what exposure you'll set, which is covered in more detail in Chapter 2. The subject of this next section is the *color* of that light and how to handle the many variations in natural- and artificial-lighting situations. Today's digital cameras can easily handle most daytime lighting situations with no problem. The obvious exceptions are during a full solar eclipse or under a dark and heavy cloud-covered sky in a summer thunderstorm. Today's digital cameras can handle many different kinds of indoor low-light situations too.

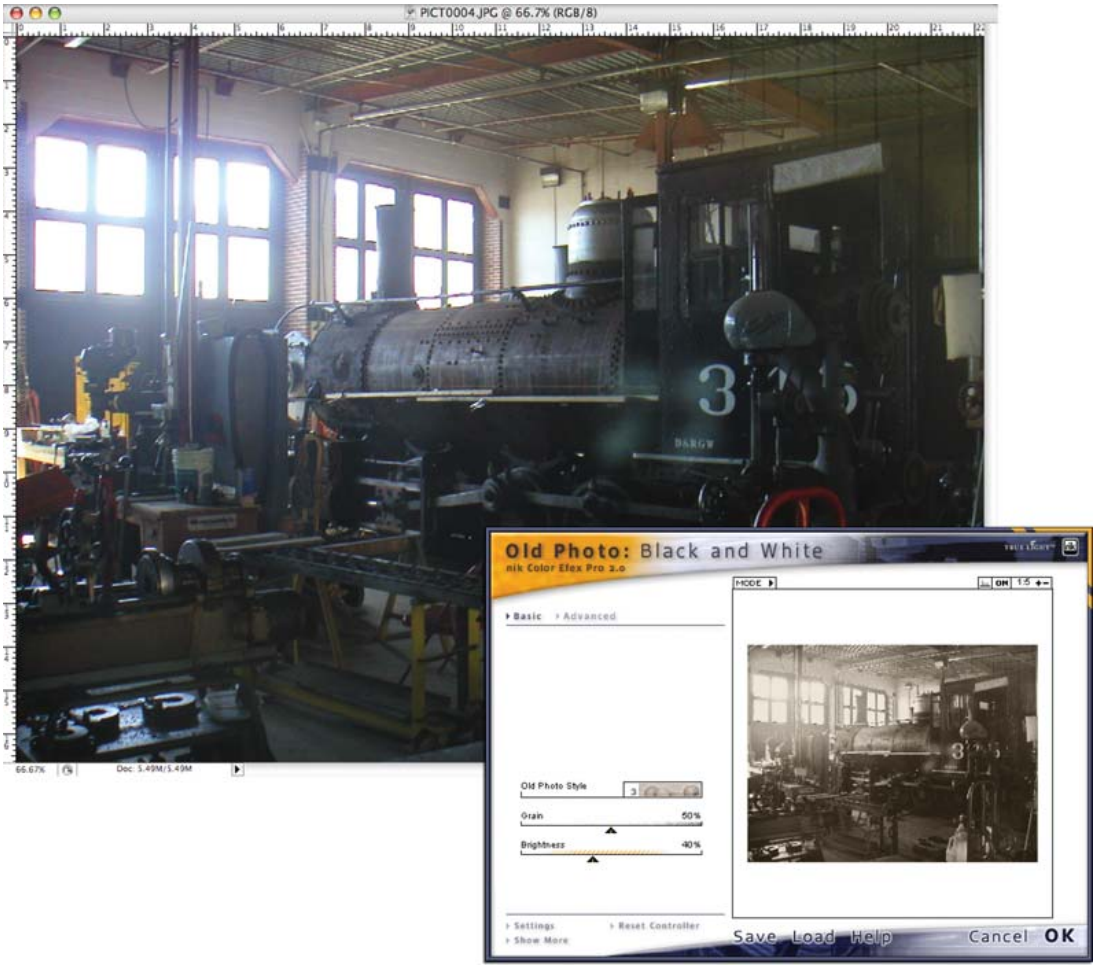
Sometimes the lighting gear can be an important part of the subject, too. Joe posed his wife, Mary, in front of a studio flash unit with an umbrella mounted and photographed her using only the flash's tungsten-balanced quartz modeling light. The Canon EOS 10D was set in Auto White Balance mode (for more about color-balance settings, be sure to read Chapter 4) and took on this blue tone that he liked. Exposure was 1/10 sec at f/4.0 and ISO 800. © 2004 Joe Farace.

Let's look at the challenges to successful artificial-light photography. The type of light indoors is quite different from that produced by the sun. Indoor light has a different color temperature and it often illuminates from different directions and angles. Do your interior images have an awful green cast to them? Unhappiness is a portrait of a blonde with green hair. Do your photographs have an orange or yellow cast to them? Unhappiness is a portrait with orange faces.

Joe shot this elaborate sculpture while waiting inside a Tokyo department store as a perfect example of mixed lighting. With three of the upper floors lit by fluorescent light and daylight coming through a skylight on a rainy day, this was a challenge best solved by using the EOS Digital Rebel's built-in Auto White Balance setting. Exposure was 1/60 at f/5 and ISO 400. More information on solving mixed-lighting problems can be found in Chapter 4. © 2003 Joe Farace.

What appears to be an old photograph was really made in 2002 at the locomotive repair facility at the Colorado Railroad Museum in Golden. The original image was shot in color through a window using a Minolta DiMAGE X point-and-shoot camera with an exposure of 1/30 sec at f/2.8 and ISO 157—at least according to the EXIF data. Image was converted to this look using Nik Software's (www.niksoftware.com) Old Photo filter that's part of its Color Efex Pro package of Photoshop-compatible plug-ins. © 2007 Joe Farace.





Nik's Old Photo filters transform an image to resemble an old photograph. Multiple styles are available to emulate different old-fashioned photographic processes. Controls are provided to affect the type of the old photo that is being emulated, the amount of grain added, and the brightness of the image. This easy-to-apply filter produces great results quickly over a wide range of photographic types. © 2007 Joe Farace.

Not enough light. The meter in the camera shouts, "Whoa, don't shoot here!" Perhaps your camera has red lights or annoying little beepers that warn of impending bad exposures. This is where you enter the realm of high ISO settings and fast lenses. By combining either or both of these items along with a solid platform to brace the camera, low-light photography becomes a bit more of a reality. Later chapters will deal with the specifics of using fast lenses and camera supports.

Painting with light

The technique called "Painting with Light" is an old one and is especially useful when light is low and you want to create dramatic lighting effects. The photographer starts with a long-duration exposure and directly adds some kind of artificial light using flash or a continuous light source into the scene. Colored gels can also be used in front of the light-painting source to add color. During the long—and I mean *long*—exposure, up to an hour or more, the camera's imaging chip records information from only the illuminated part of the scene. Everything else is still dark. Obviously, a tripod is required due to the long exposure times involved (see Chapter 6). Manual focus is also suggested, because some camera autofocus systems may not perform well in low light; and with you out there traipsing around the scene, the autofocus may try to focus on you! You should use a low ISO setting to minimize digital noise (see Chapter 3.)

Although a long exposure (one second) was used, this is not an example of painting with light because the ***subject*** is in motion. In this case, the image was made from a bus driving through the streets of Tokyo to produce the streaks you see. © 2003 Joe Farace.

On the night of July 30, 1999, Canadian Larrie Thomson packed up his camera and set out for a rural county dump to try some light-painting techniques he'd read about. You can read the details of Larrie's foray into the night, dodging skunks and wandering around in the dark, in the *Who* section of his Web site (www.nightphotographer.com), but first click the Photos link and prepare to be amazed. His 13 galleries of unmanipulated hand-painted night photographs captured in-camera are a joy to explore. As interesting as Thomson's monochrome photographs are, his color shots will stop you in your tracks. Using his light-painting techniques, the decommissioned Turner Valley Gas Plant industrial facility takes on a *Blade Runner* look combining

Larrie Thomson photographed this abandoned pickup truck near Ryerson, Saskatchewan. His "Painting with Light" tips include the following: "Be creative when planning your lighting. Look for places to hide from the camera while illuminating the scene. You can also add light from within view of the camera but this is tricky and prone to errors. For deep, saturated colour work the dark side of your subject. Color added to an object bathed in bright moonlight will be washed out, failing to register at all." Larrie exposed this shot for one minute and 30 seconds at f/5.6 using Kodak EPT 160 ISO tungsten slide film under a partly overcast sky. The same effect would have been produced with a digital camera using an ISO setting of 160 and a Tungsten White Balance setting (see Chapter 4). The foreground lighting was added with a flash unit from left and right of the camera location. The bullet holes in the windshield were highlighted with a laser pointer from left of the camera by setting the pointer to project a horizontal line and passing it up and down over the glass. The cracks and holes reflect the light back at the camera, whereas the intact areas allow the light to pass on through. © Larrie Thomson, www.nightphotographer.com.

the beautiful with the mysterious. His painted photographs of the Drumheller Hoodoos (rock formations) near Alberta take you to alien worlds and his images of an old school bus in the snow look as though they have leaped from the pages of Harry Potter. Painting with light may be one of the oldest of photographic techniques, but Thomson uses it to catapult viewers into new worlds of imagination.

Artificial natural light

Unlike Barry, Joe has never been 100 percent comfortable using studio flash units; they were a necessary evil for making portraits when available light wasn't so available. Even though digital capture provides the instant feedback formerly provided by expensive Polaroid proofs, Joe prefers continuous light sources, especially for portraits. Instead of the subject's being distracted by the repeated pop of (and the blinks caused by) electronic flash, continuous light sources let them relax. The only problem is that traditional "hot lights" are, well, *hot,* and not all that comfortable for subject or photographer. Welcome, my friends to a new world of continuous light sources powered by *fluorescent* bulbs.

I know what you're thinking. Aren't fluorescent lights those thingies that produce horrible green light when shooting with film? Yes, but as it turns out, *daylight-balanced* fluorescents are the perfect light source for digital photography. Tungsten (hot) lights produce 93 percent heat and only 7 percent *red* light. By comparison, fluorescent light is cooler, brighter, and even comes out the winner for color balance. Fluorescent-based lights used for photography are daylight balanced, and their RGB output spikes closely match the receptive RGB spikes of a CCD or CMOS imaging chip. A CCD is least sensitive in its blue channel and tungsten light has the *least* output in the blue; when combined with the infrared output of a conventional tungsten lamp (there's the heat again), a CCD can overcome the chip's spectral response.

People often ask Barry and Joe about their photographic influences, and although Joe has many, the most influential is motion picture lighting styles. In collecting images for this chapter, he decided to use portraits made in the style of the cinematographers in past and present American films. Please keep in mind that only *one light,* and sometimes a reflector, was used for all of these photographs. Being able to see the results on an LCD screen means better feedback, not just for the photographer, but also for the subject, who responds with more enthusiasm when he or she gets to see what these photos look like. Here's a look at three fluorescent portrait sessions and the movies that inspired them.

The Philadelphia Story

F.J. Westcott's all-metal Spiderlite TD5 is designed for still or video image makers (www.fjwestcott.com). It has a built-in speed ring for attaching a lightbank and three separate switches that let the photographer set multiple combinations to vary output. A handle allows quick and easy rotation of the head. The head works with either halogen or fluorescent lamps. Halogen lamps produce a consistent but *hot* 3200 K and the fluorescent lamps are rated at 5100 K, although that will vary as the lights

The Westcott Spiderlite has a built-in speed ring for attaching a lightbank and three separate switches that change the ***amount*** of light that is output by varying the number of active bulbs. A handle allows quick and easy rotation of the head.

Actress Tia Stoneman has the classic look and elegance of a young Katharine Hepburn in 1940's ***The Philadelphia Story.*** Joe placed a Westcott Spiderlite TD5 with a medium (24 × 32 inches) Westcott Box lightbank to soften the light. A 32-inch Westcott Sunlight Illuminator Reflector was placed on camera left to bounce some, but not too much, light into the shadow side of Tia's face. Joe photographed her in color (he knows that ***Philadelphia Story*** was shot in glorious black and white) against one of Adorama's custom Bella Drape muslin backgrounds that has a retro feel (www.adorama.com). Image was captured with a Canon EOS-1D Mark II and EF 70–300 mm IS zoom lens at an ISO of 640. Exposure was 1/200 at f/5 in Program mode. © 2004 Joe Farace.

warm up. After using a color meter to determine the color balance, Joe found that the Canon EOS 20D used for sessions with the Spiderlite produced better results when set in Auto White Balance mode. The fluorescent lamps provide smooth, continuous light, so all of his exposures were made with the camera set in Program mode. By looking at each image file's histogram (see Chapter 2), he used the EOS 20D's Exposure Compensation feature to gradually increase exposure in one-third stop increments to make sure exposure was balanced.

Out of the past: film noir

Joe does a lot of test shoots with new and inexperienced models. Big lightbanks and the constant popping of electronic flash units can often distract the model. The Sunpak (www.tocad.com) DigiLite 600 Flat Panel is a cold "hot light," and creates the kind of working environment that helps the model relax. The DigiLite is solidly built and easy to move around *if* your lightstand has casters. The DigiLite 600 uses fluorescent tubes that are balanced for daylight and do a good job of emulating the real thing.

The slim profile and daylight color balance of Sunpak's DigiLite 600 make it ideal for use as a main light for location photography. Here Joe photographs Ashley Rae using the DigiLite 600 as a main light with window light as fill.

Joe often uses the DigiLite 600 as a main light or sometimes as a beauty light placed *below* the model's face and in ways he formerly used a reflector back in the old film days to create the kind of look that requires the least amount of gear possible. There are some who shoot with available light, but what they *really* mean is "every light we have available." He hates to schlep all that stuff. That's why the Sunpaks work so well for his "shoot and scoot" style of photography.

In ***Out of the Past,*** Jane Greer portrays a woman running to escape her future; meanwhile, Robert Mitchum is trying to forget his past. Ashley Rae has the perfect look of a 1940s film noir heroine and was photographed using a Sunpak DigiLite 600 placed camera left. No reflectors were used because Joe wanted to create shadows that are a hallmark of this genre. The photograph was captured in Monochrome mode using a Canon EOS 20D and EF 85 mm f/1.8 lens at ISO 400. Exposure was 1/200 at f/2.5 in Program mode with a -1⅓ stop exposure compensation. © 2004 Joe Farace.

Moulin Rouge!

Lowel's (www.lowel.com) Ego is a tabletop-sized fluorescent light that looks like a lamp straight from the set of the Steven Soderbergh film *Solaris*. Setup is a breeze: attach the Ego to a lightstand and turn it on. The Lowel Ego is provided with two 27-watt screw-in daylight fluorescent lamps that have a 5,000- to 10,000-hour rating. Their Color Rendering Index (CRI) provides a more natural and realistic color balance than standard fluorescent lamps do. Lowel includes a small white card that can be used as a reflector.

When using the Ego as a main light for portraits, be sure to place the light as close as possible to the subject without getting it in the shot. Because of its small size, the Ego light is probably best suited to headshots. Joe used to hate headshots; it just took too much time fiddling to get the light looking like he wanted. The Ego sets up quickly, and—when used with a larger reflector, such as Westcott's Illuminator, placed close to the subject on the opposite side of their face—it makes an ideal headshot setup.

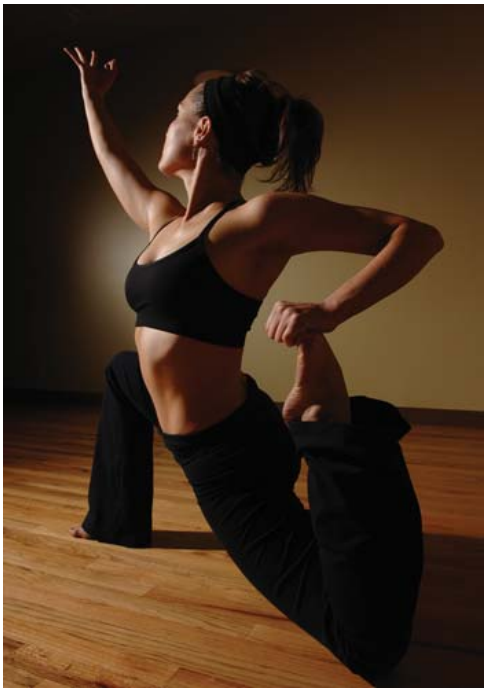
The Lowel Ego digital imaging light is ideal for shooting tabletop stills with digital or film cameras. It can also be used as a close-up portrait light for stills or video.

Joe is a big fan of Australian filmmaker Baz Luhrmann's films, especially the look of ***Moulin Rouge!*** For this portrait of Leah, Joe placed a Lowel Ego light just inches from her face on camera right and barely out of camera range. Leah is sitting in front of a Westcott April Showers collapsible background and said the light felt "soft." It looked good too. A 32-inch Westcott Sunlight Illuminator was placed on camera left for fill. Joe used a Canon EOS 20D with EF-S 60 mm Macro lens at ISO 400. Exposure in Program mode was 1/160 of a second at f/4 to minimize depth of field. A -1 stop exposure compensation was applied. © 2005 Joe Farace.

Flash in the pan

Bigger used to mean better in terms of the output from studio flash units, and even previous generations of handheld and on-camera dedicated flash units. The light output from these strobes, measured in watt-seconds, had to be voluminous. They had to be powerful enough to expose slow-speed film at mid- to small-sized apertures. Although many types of photography still require this large output of light, it's not necessary for the majority of digital photography today.

Herein lies one of the benefits of digital technology. Instead of hauling in cases of big strobe units and power packs on location, dealing with their interconnecting cables, plugging into AC power outlets, taking flash meter readings, here's our simplified approach to artificial lighting. We don't need high light output to cancel the lighting within a room (often the green cast by fluorescent) because we set our digital camera's color balance to Auto White Balance or perhaps Flash. This lets us successfully mix our flash output with whatever light is in the room for great color. We don't need the high output to enable shooting at mid-range f-stops because we can increase the ISO on the camera to achieve that. Joe and Barry often prefer shooting at wide-open apertures, blurring backgrounds; this lets the subject stand out better from the background. We don't need all of the auxiliary attachments for big strobes to control the light either because



This yoga photograph was lit with three Dyna-Lite (www.dynalite.com) studio strobes. If being shot today, Barry would create the same lighting with three of his Canon 580EX Speedlites. The main light would be set at camera left, with the head zoomed to 70 mm providing the spotlight effect. The Speedlite on the camera would be bounced off the ceiling, with its power reduced, for a bit of fill light, and the third Speedlite would be aimed at the background, with the head zoomed. © 2006 Barry Staver.

many dedicated hot-shoe-mounted speedlights have diffusers built into their heads and provide a zoom capability for the flash as well.

Perhaps the coolest feature is the ability to use one speedlight on the camera, as a master unit, controlling other speedlights set to remote mode. Instead of lugging three or four heavy cases of equipment to an assignment, Barry can create the same lighting with just a fraction of the gear. His location lighting kit includes an L.L.Bean rolling duffel bag that holds lightstands, two Chimera Panel Frames and Fabric (www.chimeralighting.com), a tripod (just in case), a Joe Farace backpack (www.adorama.com) filled with four Canon 580EX Speedlites, and an assortment of clamps, brackets, and extra batteries.

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2 Basic exposure

> *In the good old days of photography, determination of exposure used to be achieved by a combination of hard practical experience and a sort of mystical intuition. The photographer would momentarily retire into the silences of his soul and emerge with the message, "One twenty-fifth of a second at f/11"—which surprisingly often turned out to be right.*
>
> —William Mortensen

Mr. Mortensen wrote those words in *1950* but they could have just as well been written today! Whether shooting film or digital, one common factor remains important for both methods of capture: correct exposure is critical; maybe even more so for digital than for film, especially color negative film. That's because the *latitude* (the ability to over- or underexpose an image) is greater with color negative film than for any other capture media. Slide film has the least amount of latitude, especially on the overexposure side. Digital camera imaging sensors respond more like a hybrid of the two different kinds of color film: overexposure wipes out image data, but underexposure has more latitude, almost as much as film. The downside of digital underexposure is the inevitable creation of noise, especially in shadow areas, or what you might see in a photograph that appears to be digital "grain." (More on noise and how to get rid of it in

the next chapter.) The secret, as in all forms of photography, is to properly expose the image.

After all of the elaborate planning, arising in the middle of the night, traveling to that favorite sunrise "photo op spot," how would you feel if the photographs were under- or overexposed and useless? Lousy, right? Mesa Arch is one of those beautiful sunrise settings. It's located inside Canyonlands National Park, approximately 50 minutes outside Moab, Utah. After driving to the parking lot, walking the trail to the arch in the predawn darkness, you can imagine Barry's surprise when he found at least six to eight other photographers already there, waiting for the sun to rise. Many had staked out their spot by planting their tripods, and it was clear that it wasn't the first time they'd been to this much-photographed locale. What gives Mesa Arch its beauty is the way the sun reflects off the canyon wall below the arch and spreads the beautiful golden glow inside the arch. To compensate for the crowded scene and the fact that he didn't have a place to position a tripod, Barry took dozens of photographs—all handheld. He played the percentages that one of them would be in crisp focus and properly exposed. At both sunrise and sunset, photographers must work quickly, *The Golden Hour* doesn't really last for a full 60 minutes.

Photographs of this beautiful arch taken during every season of the year have been published in dozens of scenic, travel, and nature books. © 2005 Barry Staver.

The age of Aquarius

Photographically, we're in an age of enlightenment (pun intended). Whether you're a film convert or began your photographic journey with digital capture, the trip will go smoothly if you have a good understanding of basic exposure. If you don't properly expose the photograph, understanding light, figuring out color balance, and visualizing the perfect shot will be a waste of time.

Images captured with digital cameras have the same sensitivity to light as color slide (transparency) film does. If the exposure doesn't let enough light reach the sensor, the image—or part of it—will be too dark. Conversely, too much light reaching the sensor results in a *blown-out*, or overexposed, shot. Accurate exposure begins by correctly setting the lens aperture and shutter speed in relation to each other. You can set the proper exposure yourself manually or let the camera do it for you. The manual method requires either a separate handheld light meter, or you can use the one that's built in by setting the camera to Manual mode. We admit that for 90 percent of photographs made, the metering systems inside digital cameras do a fantastic job in producing correct exposure.

Believe it or not, there was a time when cameras did not have built-in light meters. Photographers used either a separate handheld exposure meter or relied on the traditional guesswork methods to set their cameras à la Mr. Mortensen's quote at the

Look up now and then. It's a great way to spot photographic opportunities. The trade-off, of course, is that by not looking ***down,*** you're liable to miss that $100 bill lying in the gutter. There's nothing outstanding about the light on the Hotel St. Francis in Santa Fe, New Mexico. In fact, the photograph was taken during the noon hour, but the subject matter and cropping provide the interest. Barry was getting into his car parked nearby when he noticed these two women tending the flower boxes. He invested about 45 minutes shooting when they were at different windows, switching between his 300 mm and 70–200 mm lens, settling on this image (taken with the 70–200 mm fully zoomed to 200 mm). He cropped from both top and bottom to further strengthen the composition.

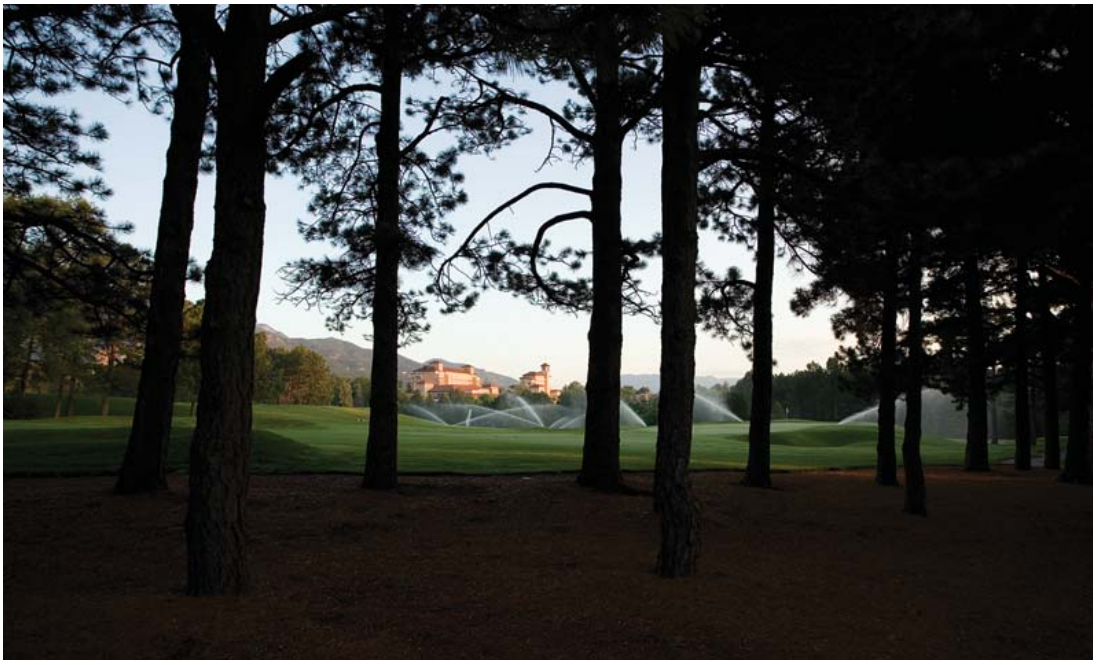
Bee ready—always take your camera with you. These beekeepers were hired to move a hive that had established itself inside a wooden sign near an office and condominium complex. Here again, subject matter wins out over great lighting. The bees in sunlight show up nicely against the dark background, and yet they also show up well against the lighter street and the highlighted portions of the beekeeper suits. A good rule of thumb if you stumble upon a situation like this: if you can hear the swarm, you're probably too close. Barry retreated to the safety of his car several times when the bees came buzzing his way. © 2007 Barry Staver.

beginning of the chapter. One guesswork method relied on the data sheet that is packaged with each roll of film, providing basic exposure guidelines for taking photographs in bright sun, hazy sun, or cloudy conditions. The other widely used method was based on the film's ISO rating and the aperture f/16 (a.k.a. the "Sunny 16") rule. To take a photograph in bright sunlight, the camera's aperture was set to f/16 and the shutter speed that came closest to the ISO number. For instance, if you were using 125 ISO film, the sunlight exposure would be 1/125 of a second at f/16. The correct exposure for 400-speed film would be 1/400 of a second at f/16, but because most cameras didn't have a 1/400 shutter speed, the closest speed—1/500—was used. When in-camera metering was introduced, it worked only in Manual mode. There were no automatic, program, aperture, or shutter preferred choices to select. Photographers still had to adjust the shutter speed and aperture themselves.

Digital camera technology relieved us of the guesswork methods of checking exposure for most common lighting situations. In

You have only one chance to get it right. That's the reality in the world of photojournalism and fast-moving action. Architectural photographers and studio photographers of still-life subjects have the luxury of time. Time to set up, check lighting, take test shots, look at them on the computer—even time to have clients, art directors, and others pass judgment—before they make the final photographs. In contrast, there was only ***one*** opportunity to photograph this medevac helicopter when it was taking off from University Hospital in Albuquerque, New Mexico. On assignment for the School of Medicine at the University of New Mexico, Barry was on the roof near the helipad, knowing that the chopper would soon take off. He chose a 14 mm wide-angle lens to show the tower atop the hospital roof and catch the chopper against the early-morning sun. The camera was set in Manual exposure mode. The lens flare to the left of the chopper is quite common when fast lenses with large front elements are pointed at a light source. © 2005 Barry Staver.

fact, the exposure is amazingly accurate, even in many poorly lit situations. Not 100 percent, but darned close. If you agree with us that light is one of *the* key elements that separate a good photograph from a snapshot, then it's still necessary to learn and understand proper exposure. The ability to tweak the exposure, even with today's sophisticated cameras, can make or break your image quality and content. We're astounded at the number of people who don't care about correct exposure, using the already worn-out phrase, "I'll just fix it later in Photoshop." When exposure is concerned, there's only a partial truth to this statement. Adobe Photoshop has indeed become a favorite crutch for sloppy camera work, but you still need to be careful in the arena of proper exposure. A digital image that is too far over- or underexposed *cannot* be completely saved with image-manipulating software. Please reread the previous sentence. Both of us routinely make minor adjustments to the automatic exposure settings as we shoot, including using the different metering patterns available in the camera, and still pull out the handheld meter from time to time.



Shooting through trees provides an exposure challenge. The elegant five-star Broadmoor Hotel in Colorado Springs, Colorado, is often photographed from the front or from one of several other "photo op" spots around the main hotel buildings (see Chapter 7). Barry discovered this unique angle the previous afternoon during a scouting trip around the hotel's golf courses. He'd been commissioned by ***Colorado Avid Golfer*** magazine to document the hotel's preparation for the U.S. Senior Open. His experience told him that the hotel would be bathed in early-morning light, with a good chance that the trees in the foreground would still be shaded. Barry's inclination was correct, and early the following morning, he captured this view from the edge of the 17th hole on the hotel's East Course. Basic in-camera metering would not have yielded a proper exposure, because the deep-shadowed foreground would fool the meter into overexposure. There are two easy ways to get correct exposure in this type of situation: One, take the light reading, in Manual mode, using a longer lens (or zooming tighter), bypassing the shadows, and reading only the light reflecting off the buildings and grass—then switch (or zoom) back to the original focal length to take the photograph. Two, use the Exposure Compensation control on the camera to counteract the meter reading that overcompensates for the shadows. © 2007 Barry Staver.

A few minutes later, Barry took "the money shot" for the ***Colorado Avid Golfer*** story, using that ***Golden Hour*** light to add shadow, warmth, and texture to the photograph. The magazine used this image double truck, or across the spread (meaning it was reproduced across two full pages). The grounds crew provided a tall ladder, enhancing the point of view. The photograph shows how the crew will mow and prep the greens each day during the big tournament. Instead of one person tending each green, mowing the fringe, then the green, they'll speed up the process with multiple people and equipment at each hole. Nothing is posed in the photograph, Barry asked the crew to "do their thing," and he shot away. He followed the crew to several greens, photographing this process. Barry chose the 18th hole, with the clubhouse and part of the hotel as the backdrop, as his favorite. The magazine's art director agreed. In-camera metering was used, without any kind of exposure compensation. © 2007 Barry Staver.

Barry's trademark is "storytelling with a camera," and his long career as a photojournalist taught him to think and photograph in terms of a story, with each photograph having a beginning, middle, and end. He didn't have to be told that photographs of the prominent personnel at the golf course must be photographed. Too often editors accept and use mediocre headshots, or posed portraits, of these people. In fact, many photo subjects expect that, and have trouble "being themselves" while Barry documents their day. Maintenance Director Fred Dickman at the Broadmoor did not fit this mold, because he very comfortably went about his duties. Once the 18th green was mowed, Barry climbed down from the ladder and concentrated on photographing Mr. Dickman. If you look carefully, you can even see the steam he's blowing from his hot coffee cup. © 2007 Barry Staver.

Painting touch-up finishes this series of Broadmoor Golf Course photographs. Feeling that his story wasn't quite complete, Barry hung around the golf pro shop, just watching and waiting for something else to happen. Sure enough, the painters returned from lunch, remixed their paint, and finished painting the building columns. Visual storytelling requires a great deal of patience, a variety of lenses, and, most importantly, people skills. The people skills are the most important, because if you can't put people at ease in your presence, the resulting photographs won't look natural. © 2007 Barry Staver.

Light and color

Light is made up of *all* colors in the spectrum. We see the color in objects because as the light falls on the object, it is reflected back to us and onto the camera's sensor at the time of exposure. Objects are colored because they absorb different portions of the spectrum. A piece of red paper is red because it reflects red light even though the white light falling on it consists of red, green, and blue. The green and blue are absorbed by the paper, leaving only red.

Metering devices measure light using two different methods: reflected or incident. Both techniques let us know the best exposure that averages the tonal range in the scene based on the mid-tone being the standard 18 percent gray. In-camera meters take a *reflected* light reading by measuring the light that is being reflected off the subject. It will not surprise you to learn that white or very light objects reflect more light than do black or dark objects. In the middle of summer in the desert, would you rather wear a white shirt or a black shirt to protect you from the sun's rays? Because black absorbs most of the light and converts it to heat, you'd do better with the white shirt, which reflects more of the light back into the air so you can stay cooler.

If the scene being measured is *average* in terms of light values, having no really large bright or dark areas, the camera meter's job is quite easy. If something in the scene reflects lots of light—for example, from a snow-covered hill, the ocean and sand at the beach, or a shiny metal object—the meter adjusts for this extra brightness and tells the camera to allow a smaller amount of light onto the image sensor. In this situation, the typical photograph does not receive enough exposure, and the images turn out darker than the original scene appeared to our eyes. On the other hand, should there be a large portion of the image with low light values—the darkened stage with someone in spotlight, mountains in silhouette at sunset, eight groomsmen in black tuxedos surrounding the bride for a formal wedding portrait—the meter adjusts for the darkness, sending more light to the sensor, *overexposing* the photograph.

The good news is that today's in-camera meters are very good at sensing those extreme hot spots or dark areas. We also have the ability to instantly view our images on the digital camera's LCD screen and make adjustments on the spot. Remember, however, that in many documentary, sports, or photojournalistic situations, even this instant image review isn't quick enough—decisive moments come and go in split seconds and can't be restaged. More importantly, we have the histogram to view for precise exposure evaluation. Barry learned the hard way that the image on the LCD screen can be misleading, and he's now an ardent believer in using the histogram to check exposure accuracy.

At a destination wedding, Barry was convinced that the reception photographs were properly exposed, based on their "look" on the LCD screens of his cameras. His style of photojournalism means he always has the camera to his eye, ready to capture each special moment. In the heat of battle, so to speak, a quick look now and then at the histogram should have sounded a loud alarm: Bad Exposure, Bad Exposure! He dismissed that, assuming that the brightness of the images on the screen was correct. It was not. He spent many, many additional hours in postproduction adjusting the selected images, correcting them to acceptable exposure levels.

Barry feels that cameras using the manufacturer's dedicated lenses (Canon cameras using Canon EF lenses, for example) are even more accurate, because the meter obtains more-exact data based on the focal length, focus point, and f-stop of the attached lens. Joe knows that is theoretically true, but still uses the lenses of other manufacturers from time to time. This monochrome image was made with a Canon EOS D30 that had been converted to ***infrared*** capture only, and was captured using a Tamron (www.tamron.com) 11–18 mm f/4.5–f5.6 Di II lens that was specifically designed for cameras with smaller-sized imagers, such as the D30. Exposure was 1/160 sec at f/16 and ISO 800. © 2005 Joe Farace.

The second method of obtaining a light reading is the incident method. This measures the overall light *falling* on the subject, not reflected off the subject. Handheld light meters are needed for this type of measurement. Incident readings are helpful when the subject is surrounded by extreme brightness or darkness that would fool the reflected in-camera reading. A performer or

speaker onstage in spotlight is a good example of when this type of measurement is useful. Generally, a spotlight illuminates the subject, and surrounding areas are darkened. If your subject is seated against a large window, the adjacent area, obviously, is very bright. In these cases, the photographer must stand at the subject's position, point the light meter back toward the camera, and obtain a reading of the light falling onto the subject. The resulting exposure will properly render the subject and leave the background totally dark (the stage) or totally blown out (the bright window). Given the accuracy of in-camera metering, we use incident metering for only 1 percent of our photography. Changing the camera's metering pattern from the default average setting to a spot meter reading gives us the "poor man's" equivalent to a handheld incident light meter. The spot meter will measure the light reflected from a very small portion of the scene, mimicking the incident meter.

This scene of Colorado Governor Bill Ritter at a speaking engagement was metered in two ways. Arriving before the audience or the governor, it was possible to go onstage and take an incident reading with a handheld meter. Once a speaker stepped to the podium, Barry used the in-camera meter, set to center averaging, to obtain a second reading. In this case, the two readings were close to one another. Barry opted to set the camera on Manual and use the reading from the handheld meter. This ensured that all of the photographs of the governor had good exposure on ***him***, disregarding the background of black drapes and the corner of the white banner. Had the in-camera meter been used in either Aperture or Shutter Priority mode, exposures would change as the lens was zoomed to different focal lengths or as the governor moved around behind the podium. © 2007 Barry Staver.

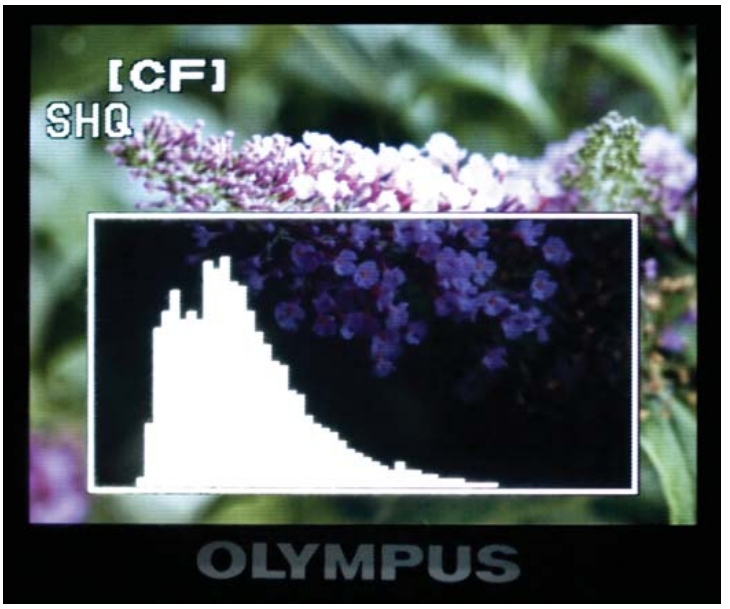
Is there really a perfect exposure? Showing a photograph to a group of ten photographers will yield ten different answers about its exposure. One person may favor a high key print, whereas another might like to see good detail in the light areas. A third photographer may like a print with equal tonality across its dynamic range. Enter one of the most useful features of digital photography: the histogram.

Meet the histogram

What's this histogram, where do we find it, and how do we use it to our advantage? The histogram is a graph showing the tonality range of the photograph. It shows us all of the values, or levels of brightness, from black through the mid-tones to white—and, most importantly shows us any values that go *beyond*. It will display on the camera's LCD screen (you will need to set it up once, through the camera's menu system), and can be displayed in most image-browsing and image-manipulation software. This discussion rests with the camera's histogram, assuming that it's being reviewed *during* the photography session, where exposure adjustments can be made on the spot. Once the images are downloaded to your computer, it's usually too late for retakes if exposure isn't correct.

Most cameras offer two histogram settings: one for exposure, and the other for color. We'll concentrate on setting it for *exposure*, because that histogram tells us the amount of lightness, darkness, and middle tones that have been captured—and, most importantly, lets us know if these values are within an acceptable range. An important concept to understand is the difference between what the human eye "sees" and what a camera/lens/image sensor can record. As photographers, if our photography is to be successful, we must learn to see as the camera sees. Our eyes can see a very broad range of tonality, from light to dark, because the iris adjusts continually, in microseconds, to changes in light and focus. The camera and lens cannot do this. Their tonal range is limited, as is the tonal range of our output (photographic prints, Web display, the printed page), and the histogram tells us if our images are within an acceptable range or not.

Another very useful exposure tool within your camera is the blinking highlights feature. Barry calls them *blinkies*, and some people call them "marching ants," and Joe thinks they are just annoying, but that's just him. You may be familiar with those terms from Selection modes in imaging software. As you highlight an area to work on it, the blinking dashes outline that area. The same thing holds true on the LCD screen of your camera. When something is selected, the areas in your image that are out of range on the highlight side are outlined with the *marching ants*. Even on the small LCD screens, the overexposed areas are



The left side of the graph displays information about shadows, whereas the right side deals with the highlights. Keep the data within the left-to-right boundaries of the histogram, although spikes shooting above the top aren't good either. A perfectly exposed image forms a good bell curve on the histogram. It doesn't spike anywhere along the top, nor does it go off the graph on either side. Underexposure can look like this histogram, but keep in mind that not all over- or underexposed images are bad. You may want an image with darkness and mood or one with high key lighting.

easy to spot. Again, just because you've got *blinkies* doesn't mean the image is unacceptable. The bottom line rests with you, the photographer, to be in final control of the exposure.

If you're working in Manual exposure mode and the photographs seem too light or dark (based on the histogram), you must adjust either the shutter speed or the aperture to compensate. If the image is too dark, you'll either open the aperture to a faster one (smaller number), allowing more light onto the sensor, or you'll use a slower shutter speed that also allows more light to strike the sensor. Because most of us are using one of the other exposure modes (Shutter Priority, Aperture Priority, or Program), we'll sometimes use the Exposure Compensation controls to tweak the amount of light hitting the sensor, although Joe seems to use it more. Cameras allow over- and underexposure control in increments of 1/3 f-stops. Compare that to the f/16 and shutter speed to ISO method, or the guidelines packaged with film (talked about earlier in the chapter). We now have precise control over our exposure. Barry and many of his colleagues routinely set their Canon EOS digital SLRs to a +1/3 or –2/3 setting for much of their interior work. When Barry used Nikon cameras, he often had the camera set to –1/3 exposure setting for outdoor photography. To find the best basic settings for your type of work, you should take the time to perform exposure tests with your specific camera. The beauty of digital photography is the ability to take an unlimited number of images and study and learn from them, without the expense of film, processing, and prints. There are no excuses for *not* mastering the functions of your camera.

The perfect exposure

Why is it necessary to achieve this degree of exposure accuracy? Remember, it's better to get the exposure correct in the camera than to waste time in postproduction. True, if you are shooting in RAW mode (see Chapter 8 for a complete discussion of RAW capture), you can miss slightly with the exposure, and still correct it somewhat after the fact. It's your time, so use it wisely.

Many photographers use the camera's built-in *bracketing* function for a wider exposure compensation solution. Bracketing is a time-honored photo technique where multiple images of the same subject are made at different exposure levels. The idea is that one of them will be the best, and some may be acceptable. Typically, in Auto Bracket mode, the first frame is exposed with no compensation, the second is underexposed, and the third is overexposed. Activating these settings allows the camera to automatically take several exposures simultaneously at different exposure settings. *Tip from Barry*: be sure to hold the camera steady as those additional images are automatically taken. This method is quite practical for landscape, architecture, studio, and still-life photography, because the subjects aren't usually moving. It's not as practical for photojournalists or sports and wedding shooters, who have only one chance to capture the moment.

As a budding newspaper photojournalist just out of college, Barry learned to photograph with only available light. Adding extra light via flash was frowned upon, downright outlawed by several of his clients. Besides, those 20th-century flash units were cumbersome at best. In those black-and-white film days, color balance wasn't an issue, and the darkroom techniques of burning and dodging were used to produce acceptable prints for the paper. As publications moved into color photography, lighting had to be enhanced. The ISO rating of color films was far too slow for available light work. In fact, artificial lighting (usually electronic flash units) was often used for good exposure, even on location assignments. Newspaper and magazine photographers often traveled with full lighting kits, setting up lightstands, positioning the lights, taking flash meter readings before they began their "candid, unposed photojournalism coverage."

Times and trends do change, and it's much more acceptable now to just add "fill light" to supplement the available light in a scene. The key is to skillfully blend the fill light so it doesn't look like any fill was used. Flash fill, when used correctly, adds a bit of crispness to the photograph. It's possible to use one dedicated flash on the camera acting as a master unit, remotely triggering one or more similar speedlights aimed into the scene. Here's a homework assignment that will reveal a little secret: look through books and magazines and study the photographs, specifically

looking at the eyes of the subjects for the "catch light." A person's eye will reflect the light source used when the image was taken, and you can often tell what kind of lighting was used to make the photograph. A small dot of light indicates a small light source, such as an on-camera speedlight. A larger round catch light is indicative of an umbrella, whereas a square or rectangle means that a soft box was used. You can also look at the shadows being cast to help determine light placement.

Using a fill light outdoors in bright sunlight isn't as crazy as it sounds. There's nothing worse than portrait photography under harsh direct overhead light. That's why *the Golden Hour* is so special to photographers. When forced to shoot at high noon, fill flash is a lifesaver, filling in the eye sockets to soften an otherwise nasty image. Proper exposure is easy if you've got a dedicated flash for your camera, although there are some flash units that work well in TTL (Through-the-Lens) mode on a variety of cameras. First, make sure the camera is set for the proper overall exposure. Set the flash to TTL mode and make a test shot. By zooming into the image on the LCD, you can see the effect of the fill light in the subject's eyes. The best way to increase or decrease the amount of fill light is by adjusting the exposure compensation of the flash unit, *not* the camera.

Really available light

Whenever possible, Barry still prefers to use the available light for his photography. In addition to the histogram, the ability to change ISO and adjust white balance are the biggest advantages of digital photography. Using this technology combined with ultrafast lenses (see Chapter 5) produces superb results in situations once deemed too dark for traditional film-based available light photography.

The following photographs were taken at a national symposium on health care, held annually in Beaver Creek, Colorado. In addition to photographing the keynote sessions, Barry had to photograph each breakout session, with several of them running concurrently in different locations. A few were held in windowless rooms with a mixture of overhead fluorescent and incandescent light; one took place in a room illuminated by one full wall of windows plus overhead incandescent lighting. It was easy to work between the different rooms by merely changing the White Balance and ISO settings on the camera before shooting in each. Film-based photographers are limited in both of these areas, because each roll of film is manufactured to one ISO value and one light temperature value. The quality of photographs made with high-ISO film has been less than ideal, and film was never color balanced for the myriad of different light temperature sources.

The wall of windows in the background provided lots of soft, bright sidelight for the sessions held in this room. The chandelier above provided a little bit of fill light, much warmer in color temperature than the light coming from outside. (See Chapter 4.) © 2007 Barry Staver.

With the strong window light at his back, Barry was able to comfortably use an EF 70–200 mm f/2.8 lens to get tight facial expressions. These types of candid photographs taken during breaks help bring meetings and seminars to life. © 2007 Barry Staver.

Dramatic effects occur when you take lights that already exist in a scene and include them into your photographs. It's obvious that lights on a Christmas tree or a house add sparkle and brilliant illumination to an otherwise ordinary image of the tree or building. Don't overlook lighting that exists in ordinary scenes as well. A reading lamp, track lighting, TV or computer screens, or other interior illumination can add contrast, depth, and more

The same light coupled with the light-colored room divider on the right made this available light photograph possible. The window light illuminated the woman, and the reflectance from the divider provided fill light on the man's face. Without that panel, his face would have been quite dark, possibly needing some fill flash. Using a flash in these types of situations is distracting to subjects, making them more camera aware, and candid moments are often lost. The subjects' red shirts sure helped the image "pop" too. © 2007 Barry Staver.

interest to the photograph. Turning on these additional lights within a room will give an otherwise plain image a real boost. Including a reading lamp with the person using it for illumination also adds a reality factor to the shot by showing where the light source originated.

Exterior shots benefit from lights within the scene too. A streetlight, storefront lighting, interior lights shining out through windows—all give extra sparkle to the photograph. Be sure that the technical and/or aesthetic quality of your image isn't adversely affected. On the techie side, careful metering should keep the light sources in the shot from overpowering the exposure, causing an underexposed photograph. Aesthetically, keeping the lights from overpowering your subject will ensure their inclusion as accent items only. A prominent light in the foreground will draw attention away from your subject very quickly.

Creating high dynamic range images

A photograph's *dynamic range* is the ratio of contrast, tonal range, or density between black and white, and can literally be interpreted as the range of f-stops that can be captured from a clean white to total black. Some photographers may recognize that these tonal areas are what Ansel Adams's Zone System calls Zones IX and 0. The problem facing all photographers is that most digital cameras—and film cameras, for that matter—*compromise* when it comes to capturing the overall tonal range of a particular scene.

Let's do the math: real-world scenes contain light ranges that are far in excess of what printed media allow to be produced. So

With normal image capture, when the dynamic range of that scene is too great for any part of the digital capture process, something's gotta go; you have to choose between losing detail in the shadows or the highlights. These are the three image files that were used to make the composite HDR image (High Dynamic Range). © 2007 Joe Farace.

how do you represent the light values in a scene using a limited set of light values? HDR (High Dynamic Range) is a buzzword that's gaining in popularity for digital imagers, and just might hold the answer. The concept behind HDR is the ability to use a technique that can create an image whose overall tone values match the *luminance* of what the human eye records, not what a computer screen or print reproduces. Luminance is the brightness, or grayscale level, of a color. Together with *chromaticity,* luminance defines a perceived color.

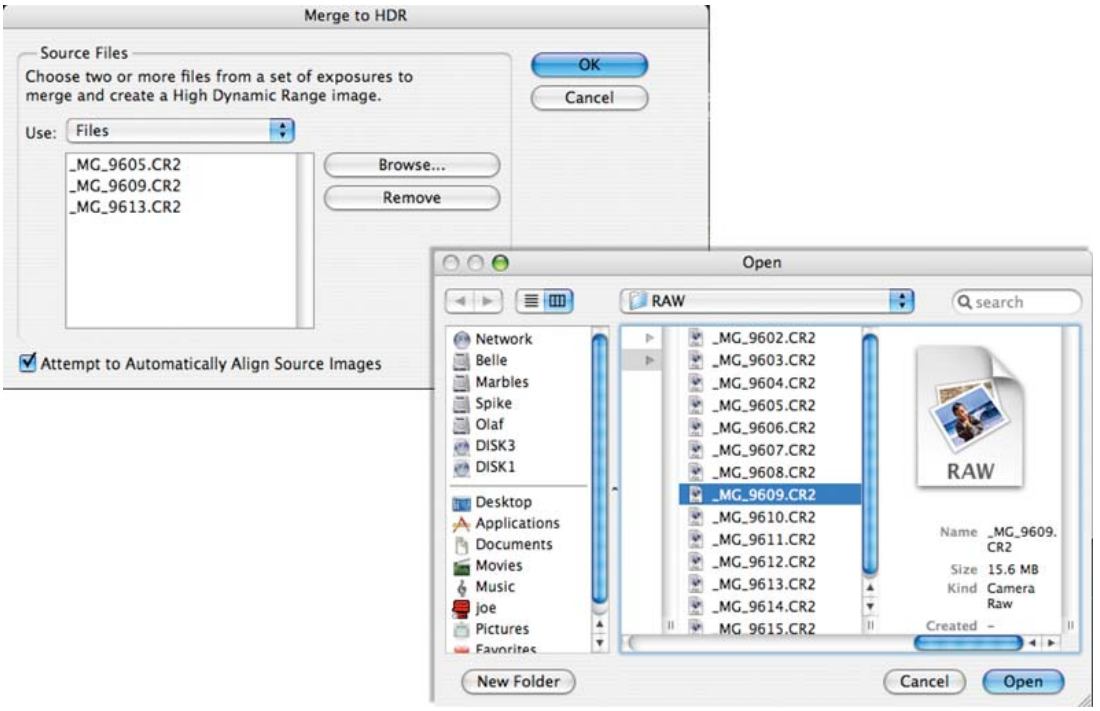
This photograph, made in the morning at Barr Lake in Colorado, has an extreme dynamic range ranging from a "bald-headed" sky in the background to inky shadows in the foreground. It was one of 12 exposures made, and was the one in the middle (1/60 at f/10 at ISO 100) of the bracketed series. © 2007 Joe Farace.

This HDR image file is a composite of three RAW files from the 12-shot series, and include files that are 1⅓ stops over- and underexposed, as well as one from the middle exposure. We hope that the book's reproduction will help you see the difference between this and the "normal" image file. If not, it's easy to try HDR and see for yourself. © 2007 Joe Farace.

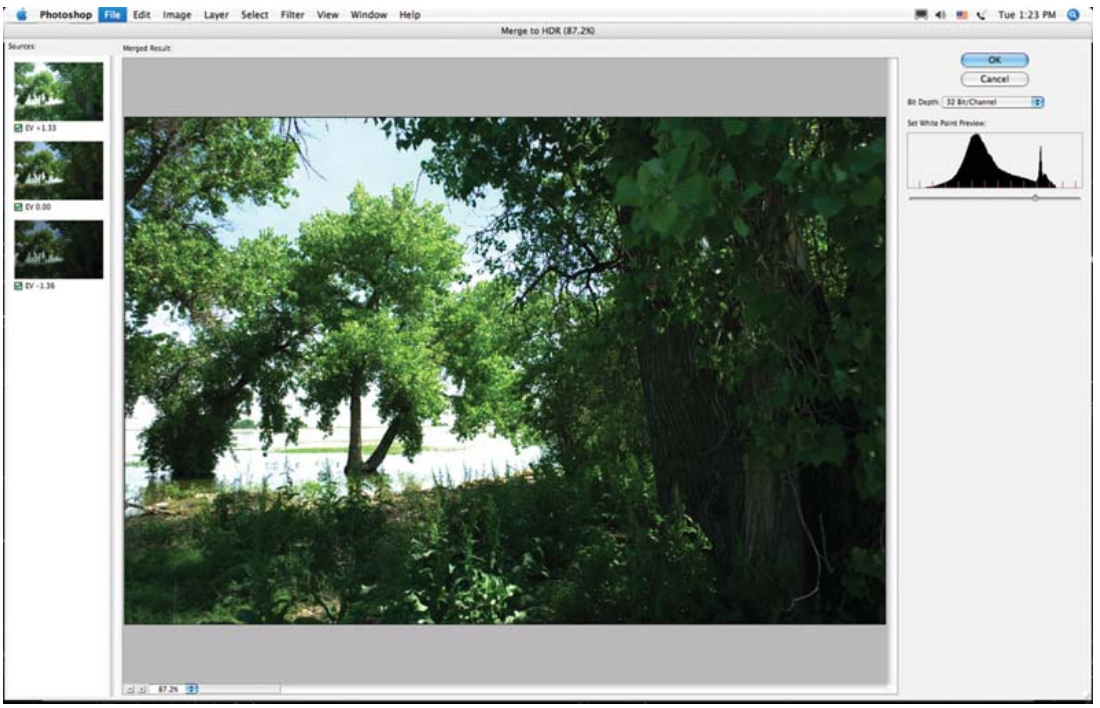
HDR in Photoshop

Both Adobe Photoshop CS2 and CS3 let you create High Dynamic Range photographs by combining multiple individual images that were captured at different exposures into a single 32-bit image that has an *expanded* dynamic range. The luminance values in an HDR image are directly related to the amount of light in a scene. This is not true of 16- and 8-bits-per-channel image files that store luminance values only from black to white, and represent a small segment of the real world's dynamic range. For all the geeks out there, Photoshop stores all of an HDR image's luminance values by using a 32-bits-per-channel floating-point numeric representation. Floating point is a notation system in which the decimal point is not fixed, allowing very large or very small numbers to be easily handled, and the data are not subject to the kind of rounding errors that often occur in image editing.

You can create your own HDR image using multiple photographs, each captured at a different exposure (a.k.a. bracketing) by using Photoshop's Merge to HDR (File > Automate > Merge



Building an HDR image is easy: start by shooting a series of bracketed RAW files. Photoshop's Merge to HDR command (File > Automate > Merge to HDR) lets you choose the two or more image files that will form the basis of the finished HDR image.

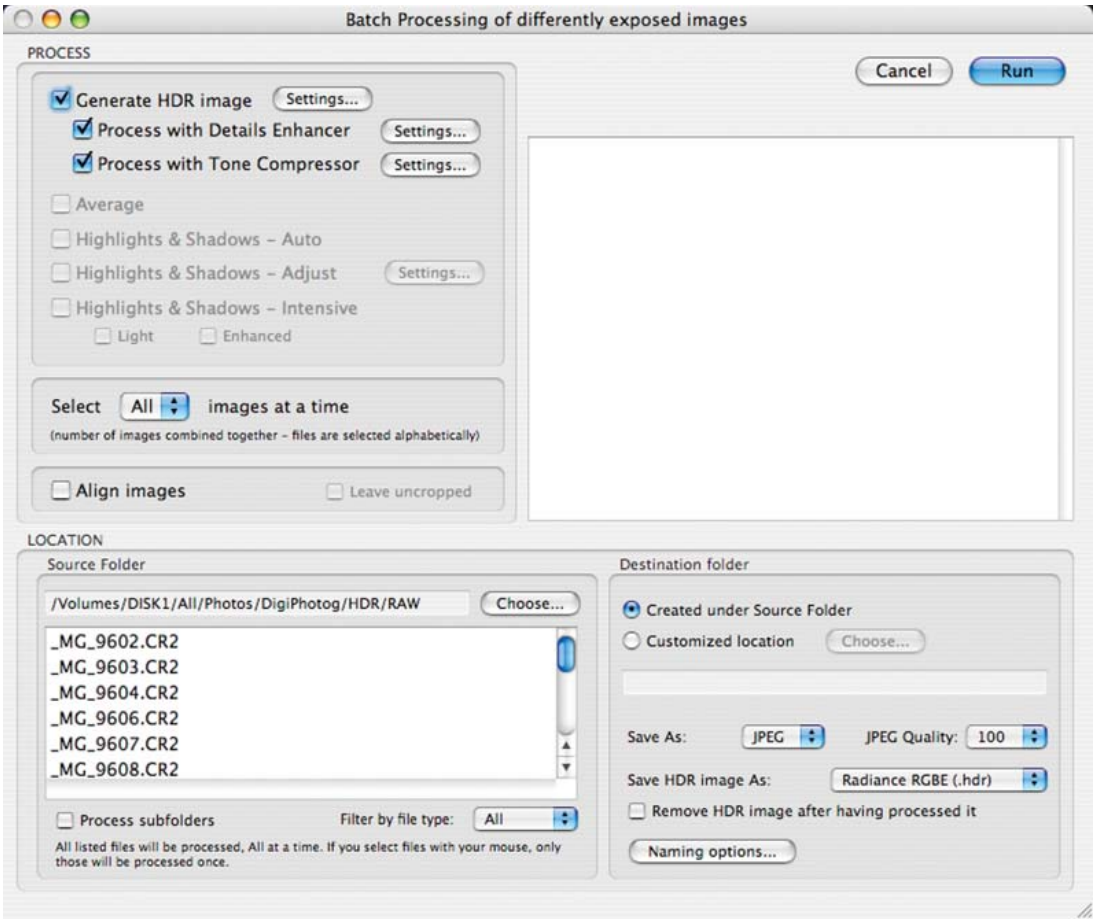


Photoshop's HDR interface shows the component images that go to form the HDR images. You need a minimum of two so you can load more and choose an optimum combination of images to produce the results you want. As you can see, the few other controls are simple. The interface in both Adobe Photoshop CS2 and CS3 is identical. © 2007 Joe Farace.

to HDR) command. Because an HDR image contains brightness levels that far exceed the display capabilities of a standard monitor or the range of tones in a printed image, Photoshop lets you adjust the preview of the HDR image so it can be viewed on a computer monitor. Now all Photoshop tools, adjustments, and filters can be applied to HDR images. If you need to print the image or use tools and filters that don't work with HDR images, you can always convert the HDR image to an 8- or 16-bits-per-channel image.

Other HDR software

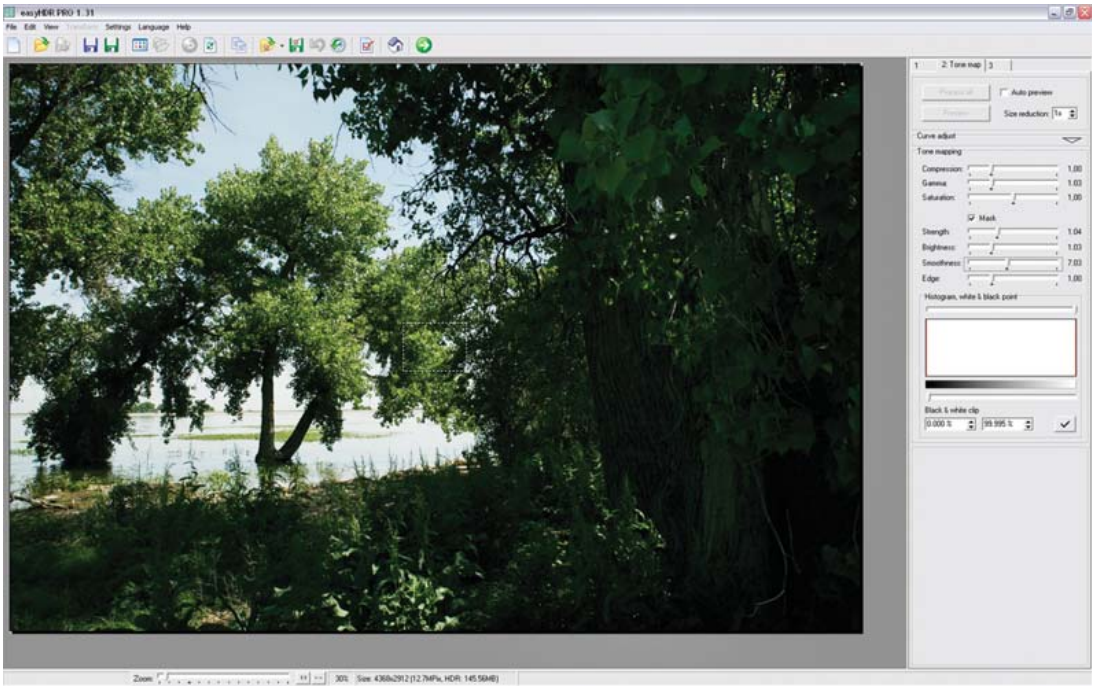
You don't have to own Adobe Photoshop to create HDR images. Lots of software that produces these kinds of files is available from other sources. Photomatix Pro (www.hdrsoft.com) is avail-



Photomatix Pro is a stand-alone program that runs on Mac OS X and Windows. The Tone Mapping tool is also available separately as a plug-in compatible with Photoshop CS2. © 2007 Joe Farace.

able in both Mac OS and Windows versions and costs $99. If you have ever photographed a high-contrast scene, you know that even the best exposure will typically have blown-out highlights and flat shadows. Photomatix offers two ways to solve this problem: Exposure Blending lets you merge differently exposed photographs into one image with increased dynamic range. Tone Mapping reveals highlight and shadow details in an HDR image created from multiple exposures. The tone-mapped image that's produced is ready for printing while showing the complete dynamic range captured.

easyHDR (www.easyhdr.com) is a Windows-only solution that blends a sequence of photos taken at different exposure values into an 8-bit tone map HDR image file. It uses an autoalignment feature, and lets you adjust tone curve to fine-tune the contrast as well as to do postprocessing on the resulting image file without, they claim, "any quantization losses." The program works with some RAW images—as well as BMP; JPEG; and 24-, 48-, and 96-bit TIFF and Radiance RGBE file formats—and lets you save as BMP, JPEG (without



easyHDR is Windows-based image-processing software that produces tone-mapped High Dynamic Range images from normal, 24-bit, true-color photos taken with a typical digital camera, letting you squeeze much more from your camera than you could have imagined. © 2007 Joe Farace.

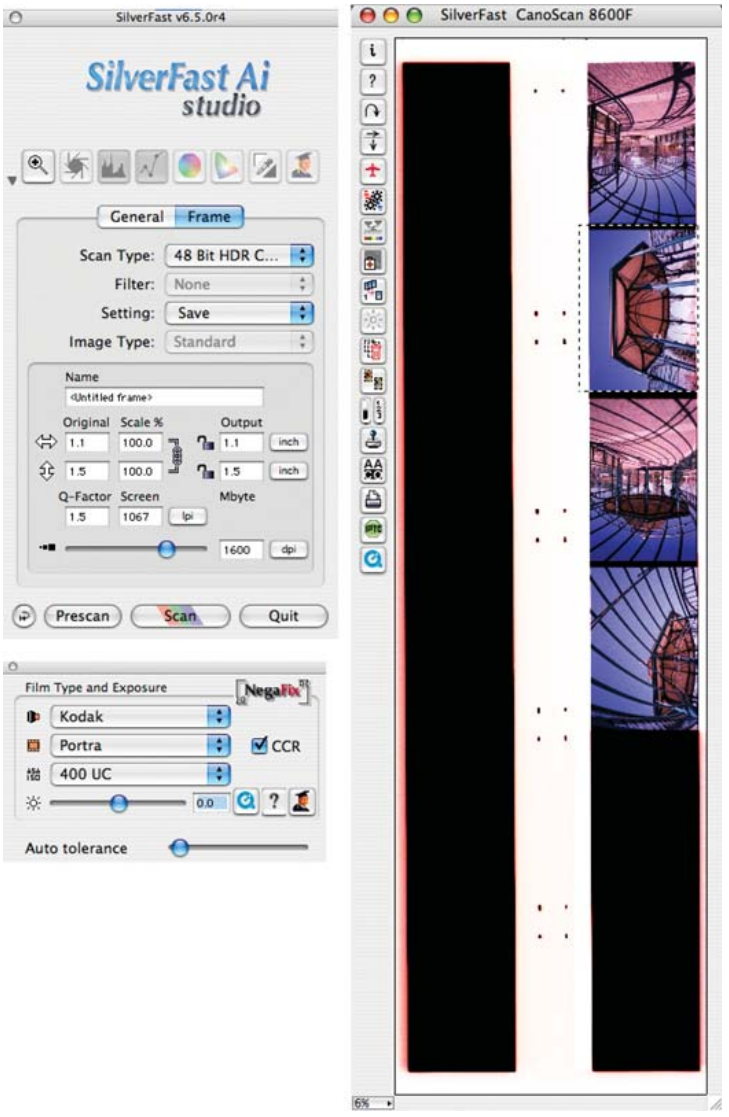
loosing EXIF headers), or 24- and 48-bit TIFF using batch processing. A trial version of the program is available, so you can try it yourself along with a freeware program called easyHDR BASIC that has fewer features and the simplest and most basic HDR-generation and tone-mapping functions. But it's *free*!

For a list of other free HDR programs visit WebHDR (http://luminance.londonmet.ac.uk/webhdr/software.shtml). The site lists only software—for Linux, Mac OS, and Windows platforms—that is available free of charge and fully functional. This list may include some free versions of commercial software, but they are included only if the results are not hobbled by watermarks or other limitations, and if the software does not expire after the trial period. The functionality of any free version might differ from the full commercial version, such as easyHDR BASIC, but must still be supported and under development.

HDR files from scanned film

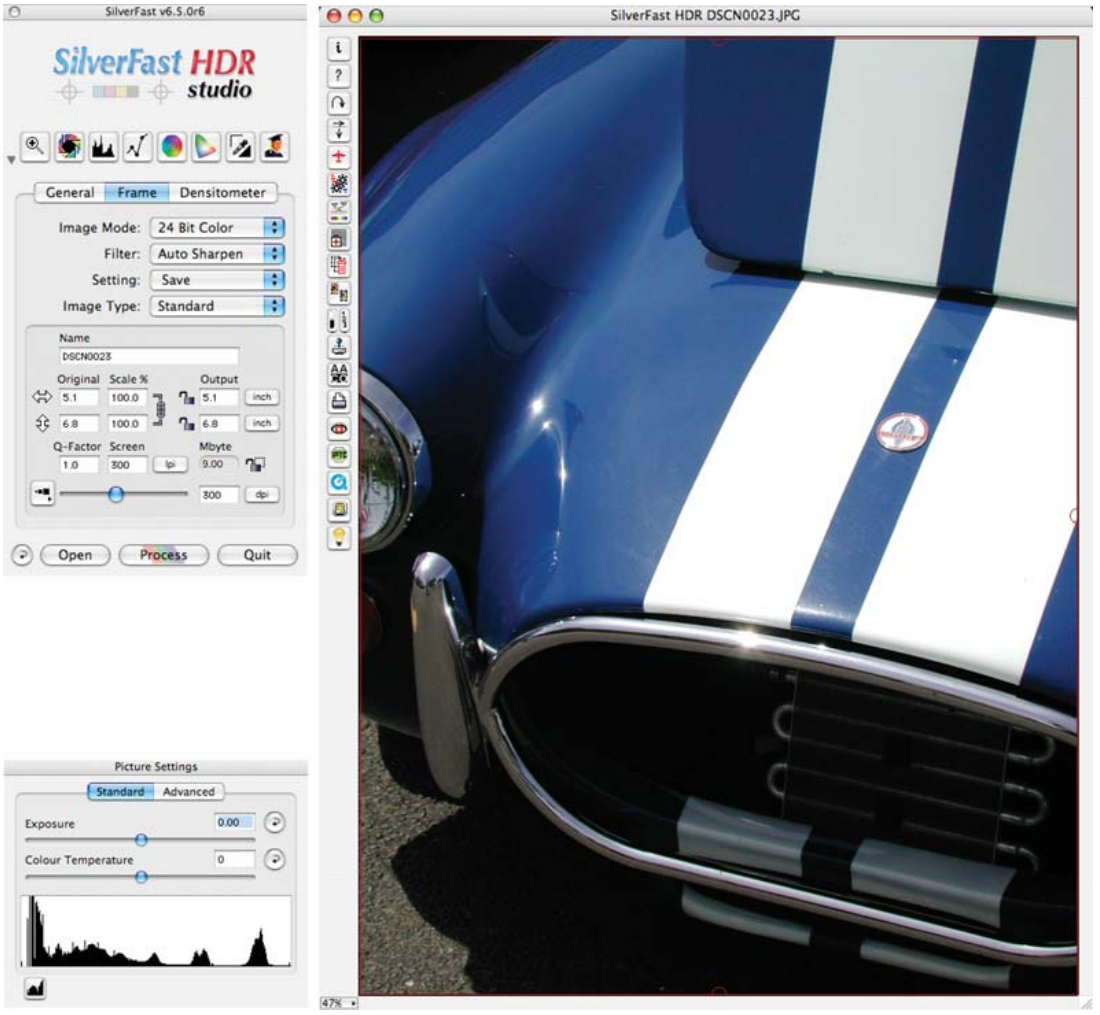
You can even create HDR images from slides and negatives that are found in your existing film library. Normal scanning software saves images only as 24-bit files, discarding the extra information created by the scanner, but LaserSoft Imaging SilverFast 6.5 (www.silverfast.com) lets you produce 48-bit files, retaining all of the information that's in the original piece of film. SilverFast 6.5 can produce different scan exposures, thus increasing the dynamic range and allowing subtle nuances in shadow and highlight areas. This Multi-Exposure function (you can think of it as bracketing with your scanner) allows film to be scanned several times, but with *different* exposure intensities. I use SilverFast scanning software with a CanoScan 8600F, but the software is hardware specific, so check the company's Web site (www.silverfast.com/product/en.html) for a list of scanners that are covered by the product. You can even download and try Mac OS or Windows demo versions of SilverFast 6.5 for free.

After scanning the film using no corrections, you can pass the resulting TIFF file to SilverFast HDR, a complementary program that lets you read and process 48-bit RAW files without being connected to a scanner. Unlike Photoshop, which limits the amount of image-editing and image-enhancement tools when working with HDR images, all of the normal SilverFast tools are available. They include Defining Output Size & Resolution, Auto-Adjust Highlight/Shadow, Three Part



The new SilverFast 6.5 scanning software, with its extensive selection of editing tools, has been enhanced with several new features, including an improvement to its NegaFix function that automatically reduces color casts when scanning negatives. © 2005 Joe Farace.

Histogram, Gradation Curves, Selective Color Correction, Unsharp Masking, Color Cast Removal Slider, and Color Separation. SilverFast HDR is available as a Photoshop-compatible or TWAIN plug-in and as a plug-in for both Mac OS and Windows platforms.



Because SilverFast HDR works with only a "preview," you don't need to load the full-resolution image. This assures fast, real-time processing that, combined with color management, guarantees high image quality and color precision. © 2004 Joe Farace.

What does it all mean?

Although there is no doubt that HDR techniques can create dramatic-looking images, there is far from universal acclaim for the concept. Some critics claim that the resulting images are "not realistic," but we believe that photography was never intended to produce only realism, but rather, to serve as a way for the image maker to produce an *interpretation* of a scene. HDR is just the latest tool in our digital imaging toolbox; give it a try and make up your own mind.

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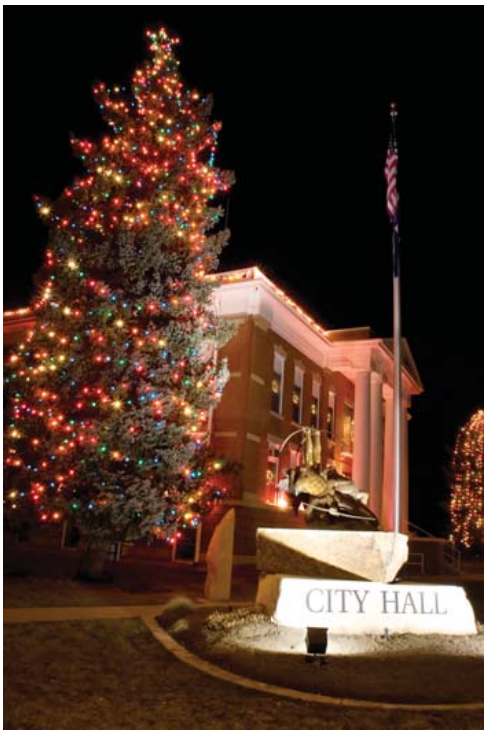
3 Digital noise: What it is and how to deal with it

Pictures, regardless of how they are created and recreated, are intended to be looked at. This brings to the forefront not the technology of imaging, which of course is important, but rather what we might call the eyenology (seeing).

—Henri Cartier-Bresson

Noise in digital photographs is the visual equivalent of static you hear in radio signals, and most digital cameras add some level of noise to images. In traditional photography, the nearest equivalent is film grain. Like film, digital noise is noticeable in images shot at high ISO settings, and more visible in areas of uniform color, such as skies and shadows. Digital sensor noise may also be increased when long digital exposures are made under low-light conditions, such as night photography, and noise is always more obvious in areas of underexposure.

Camera noise is spread across the frequency spectrum, and includes fine and coarse components. Noise varies with color and brightness, and it *is* different for every camera (or scanner too), but blue-channel noise is usually higher than in other channels, and shadow noise is typically higher than brighter areas. Too much image compression produces an effect that appears to be noise but is really JPEG *artifacts*. This is an entirely different



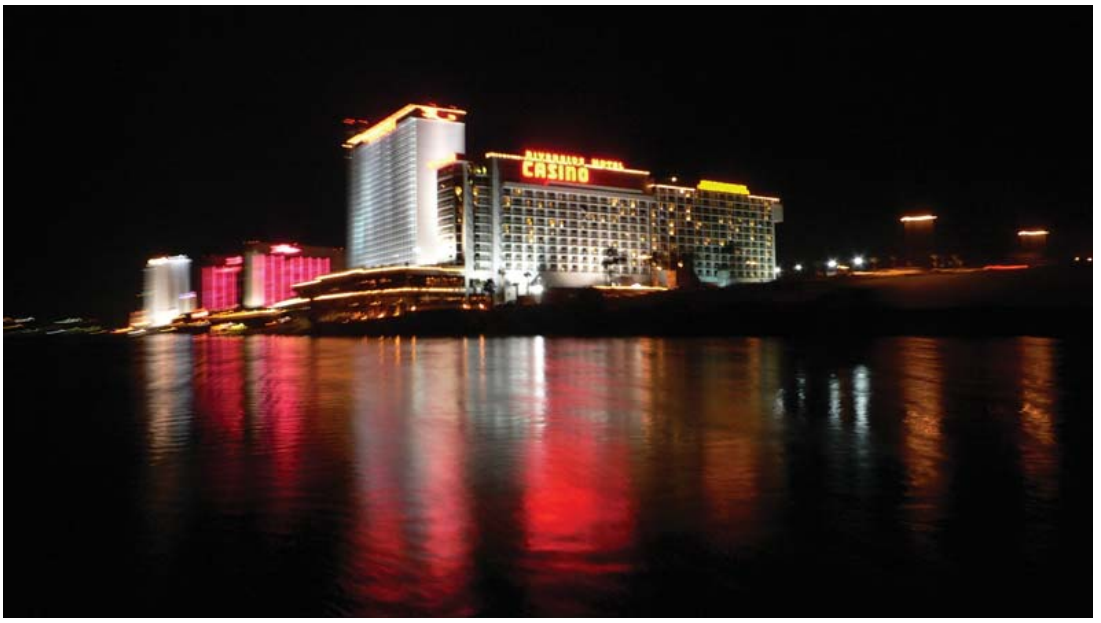
A good tripod (see Chapter 6) must be steady enough to allow exposures that are not only long, but less noisy as well. Camera was a Canon EOS 1D Mark II at ISO 200 with an exposure of ten seconds at f/20 in Manual mode and ISO 200. © 2005 Joe Farace.

problem, but one that may have a similar solution. (See "Noise Comes in Different Flavors.") Digital cameras with physically larger sensors (not just more megapixels) tend to produce less noise than do those with smaller sensors. This is because the size of the chip allows larger pixels to absorb more light.

If noise is the problem, digital noise reduction (DNR) is one of the software solutions. Most of today's noise-reduction software relies on *wavelet theory*, which is a mathematical method that allows the software to identify and suppress noise at different frequencies, locations, and color channels. There are lots of different noise-reduction products available for Mac OS and Windows computers. Joe has tested many of them, and here's a short list of useful products in order of my preference. Keep in mind that your camera and the kind of images *you* make may be different from mine or Barry's, so download a demo version of any of these products that sound interesting and give them a try.

Noise Comes in Different Flavors

Like film grain, digital noise has many causes: Dark noise comes from heat produced in the camera's sensor during image capture. The dark current created ends up being collected along with the data from light passing through the lens. Random noise is created by fluctuations within the camera's circuitry or even from electromagnetic waves outside the camera. Signal noise is caused by fluctuations in the distribution of how light strikes an image sensor. You'll sometimes hear the term signal-to-noise ratio, which is a measure of signal strength relative to background noise. Amplified noise is caused by high ISO speeds, and is the digital equivalent of chemically "pushing" film in order to achieve greater light sensitivity. Then there's accumulative noise, which is caused by using slower shutter speeds.



This photograph was made with a Leica D-Lux 2 point-and-shoot camera. Exposure was 3.2 seconds at f/6.3 at ISO 80. (Joe thought it was set for 800, proving that even guys who write books should use a flashlight at night to check their camera settings.) Although not tack sharp, the photo is almost acceptably sharp enough due to the D-Lux-2's built-in image stabilization, which, in this particular rocky boat situation, was probably a better bet than a tripod. © 2006 Joe Farace.

Noise comes from many sources

Digital noise from sunspots? Yup. Scientists, especially astronomers, analyze *hot pixels* to measure the effects of solar particles and cosmic rays on digital images and you could extrapolate that sunspots indirectly cause hot pixels due to the solar particles and cosmic rays they generate. Closer to earth, there are other electromagnetic sources that cause noise in your digital images. Here are some situations that you should avoid:

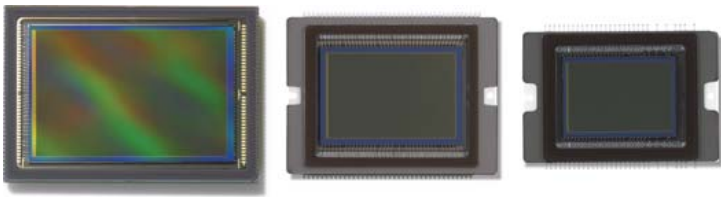
1. Photographers should avoid placing external battery packs close to their digital cameras. Some of these packs contain transformers that raise voltage levels for faster flash recycling and emit electromagnetic interference at the same time. This can result in severe degradation of digital image quality with heavy banding effects. In such cases, the best work-around is to carry the battery pack on a belt or a photo vest while connecting it to the flash unit via a cable.
2. Photographers should also avoid taking pictures close to other strong sources of electromagnetic energy. For example, it's quite common to see heavy banding in digital images shot from the observation deck at the Empire State Building in NYC due to the presence of strong antennas at the top of the building. Similar situations can occur in sports photography when the photographer is standing too close

to a TV camera crew that is using a microwave dish to transmit the video feed back to their base station.

Chip size vs. noise

In general, imaging chips come in three sizes: Full-frame chips are those that closely, even exactly, match the 36 × 24 mm frame size of 35 mm film. Some digital SLRs use the APS-H sized sensor, which measures 29 × 19 mm; others more commonly use the APS-C sized sensor, which measures 22 × 15 mm. Other cameras use the Four Thirds system developed by Olympus that is now being used by other manufacturers, including Panasonic and Leica, and is smaller than most other digital SLR sensors. The size of this sensor is 18 × 13.5 mm, and it has an imaging area of 17.3 × 13 mm.

When it comes to image quality and reduced noise, ***size*** does matter. On the left is the full-frame chip from the Canon EOS-1Ds Mark II. Next is the imager from the Canon EOS-1D Mark III, and finally there's the chip from the EOS Rebel Xti. Images courtesy of Canon USA.



This is the original Kodak Four Thirds CCD sensor used in the initial camera offerings from Olympus. More-recent cameras introduced by Olympus have used a Panasonic NMOS sensor mounted to a flexible circuit board. It looks a bit different, but is the same four-thirds size. Photo courtesy of Olympus America.

There are lots of debates about the advantages and disadvantages of using large, full-size (24 × 36 mm) imaging chips in digital SLRs, but the one obvious advantage of full-frame sensors is the ability to combine high resolution with large pixel size. Remember that each pixel on an imaging sensor transmits an electronic signal only in proportion to the brightness it receives. In effect, a pixel is acting as a tiny light meter. A larger pixel has a greater surface area available for gathering light. More light collected means that less amplification is needed for the output signal of each pixel, and less is better because magnifying low-level signals increases noise. For

example, if the chip's base area is five times the average, then light-gathering and light-storage capacities also increase five-fold. In the extreme case of low-light photography and ISO ratings of 800 or faster, high signal-to-noise ratios give full-frame sensors a greater advantage.

After 40 years of using another brand (read about it in the first edition of this book), Barry recently switched camera systems to Canon. One of the main reasons for the switch was Canon's ability to produce better-quality image files at higher ISOs with less noise. Nowadays, he confidently sets the camera ISO to 800 and higher without worrying about image quality. © 2007 Barry Staver.

Shutter speed vs. ISO speed

This is a balancing act based on achieving the best balance for minimizing noise. Joe's basic rule of thumb is that he always shoots at the lowest possible ISO setting (in order to minimize noise) depending on the working conditions. If he has a tripod, he'll shoot at long shutter speeds to minimize noise because digital capture is not subject to exposure or color-balance reciprocity problems that plague traditional film capture.

Reciprocity refers to the inverse relationship between the intensity and duration of light that determines the correct exposure of film. During long exposures, film responds much more slowly than usual, and this affects both the color and the light sensitivity of film. This is why color film that is "pushed" in the photo lab to higher ISO settings than what it was designed for sometimes exhibits a color shift in a certain direction. The film's light-sensitive grains must be hit by a certain number of light photons within a certain time frame in order for the latent image to form. Breakdown in the linear relationship between aperture and shutter speed is known as *reciprocity failure*. Each different film emulsion has a different response to long exposure. Some films are susceptible to reciprocity failure and others less so. Some films that are very light sensitive at normal illumination levels and normal exposure times lose much of their sensitivity during long exposure times, and some films that have low ISO ratings

under normal exposure duration retain their light sensitivity better at long exposures. Most film manufacturers publish data on the necessary reciprocity corrections, but digital shooters can ignore this information.

Do a noise test

What is surprising to me is how often people are surprised by the amount of noise in their images. They crank up their ISO speed to 1600, shoot at 1/4 second, and are surprised by the amount and size of the noise. If you like to shoot available light images—and we have to assume that you do, or you wouldn't be reading this book—one of the first things that you should do with a new camera is make a noise test. Don't freak out. It won't take long and the information will be invaluable.

Set up a situation that will produce longer-than-normal shutter speeds and use high ISO speeds. Don't use just one ISO—shoot at 400, 800, 1600, and whatever else your digital SLR can produce. Be sure to bracket exposures. Even though digital capture is not subject to exposure shifts under slower shutter speeds, bracketing exposures might tell you that slight over- or underexposure in a given lighting condition might increase or decrease the effect of digital noise. Be sure to include a known color target such as a Macbeth ColorChecker (*www.gretagmacbeth.com*). Color won't usually shift, but it provides some smooth patches that will show noise better than textured ones, and there are cameras whose color fades as ISO increases.

Open the files and use your image-editing program's magnifying tool to look at the noise and determine the optimum settings to produce the least amount of noise. Take your time and compare over- and underexposed examples. Although this process won't eliminate noise, it will make you aware of what switching from ISO 400 to 800 will cost you. You may be able to live with the amount of noise, but if you can't, you'll now know that you'll need a tripod so you can use a lower ISO speed. Be aware that longer shutter speeds and any underexposure will exacerbate digital noise. By taking the time to make these tests, you will have the *information* needed to make the right choice for the lighting conditions you are working under.

Built-in noise suppression

The way most camera manufacturers accomplish in-camera noise suppression is a blend of marketing buzzwords and high technology, and how noise is handled in-camera varies greatly between camera manufacturers and is highly proprietary. For those readers who are interested in how on-chip noise reduction is accomplished, here's a brief overview.

This is a bracketed series of unretouched image files that were part of the noise test for the Olympus EVOLT E-500 camera. The camera was placed on a tripod and a slate was used to show the camera used. Most of the date, including ISO that is shown on the slate for quick identification of a particular image series, can be found on an individual file's EXIF data. Exposure on the first shot was 1/5 sec at f/22 at ISO 800, but the test covered all ISO speeds from 100 to the camera's maximum ISO speed. © 2007 Joe Farace.

This photograph made on The Strip in Las Vegas was captured with a Canon PowerShot SD10 digital point-and-shoot camera that has a small imaging sensor, so noise should be a big problem, right? Nope. A combination of the built-in noise suppression, low ISO, and moderate 1/8 sec at f/2.8 exposure produced surprisingly low noise. © 2004 Joe Farace.

On-chip noise comes in two flavors: Fixed-pattern noise is produced from uneven signal boost among different pixel amplifiers, and random noise occurs when shooting at different times of the day. Random noise is typically suppressed when the sensor resets the photodiodes that store electrical charges. Some digital SLRs provide a user-selectable noise-reduction function that attempts to eliminate this noise after the file has been written, sometimes at the expense of fine detail. That's because even though many think the sensor is the key to image quality, its signals are totally unrecognizable as an image until they've been gathered and processed. That's why some digital imaging processors prevent noise from occurring in the processing stage. The noise that remains is only the noise actually produced by the sensor.

More power creates more heat and noise. CCD sensors also have increased power consumption at longer shutter speeds; more electricity flowing means, again, heat and noise problems. Because of the literally millions of photodiodes and amplifiers

incorporated into a CMOS sensor, and the tiny differences in performance from pixel to pixel, you're going to find noise in the output image. To overcome this problem, Canon, for example, developed on-chip technology to record the noise of each pixel before exposure, and automatically subtract such noise from the image when it is created. The incorporation of noise reduction on the sensor enables the reading of a noise-free signal. This on-chip circuitry can be added only to CMOS sensors, not to CCDs, because of the differences in the way the two are manufactured. To counteract noise, Canon added a fourth transistor that acts as a transfer gate. Kodak designed four-transistor CMOS pixels in their own proprietary configuration, whereas Nikon's LBCAST (Lateral Buried Charge Accumulator and Sensing Transistor array) is a completely new type of image sensor that's different from CCD and CMOS. LBCAST saves more power and achieves less dark noise while increasing image-processing speed and improving sensitivity, contrast, and color reproduction.

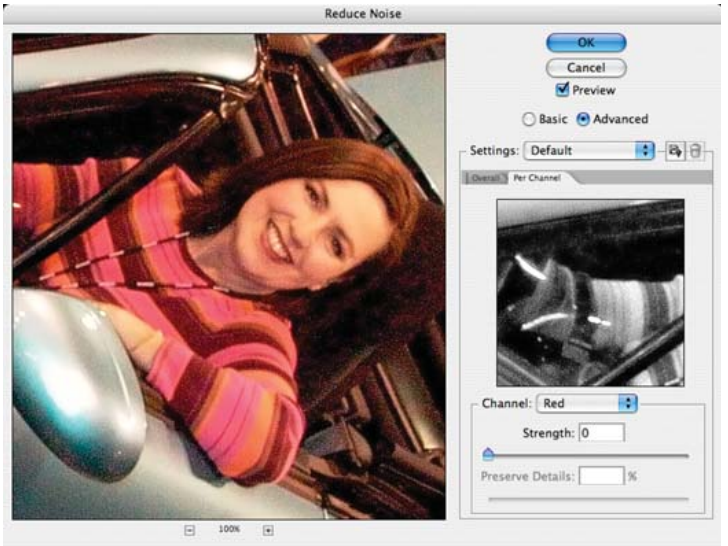
Fixed-pattern noise can be suppressed with noise-reduction and on-chip noise-reduction technology. A typical approach is CDS (correlated double sampling), having one light signal read by two circuits. First, only the noise is read. Next, it is read in combination with the light signal. When the noise component is subtracted from the combined signal, the fixed-pattern noise can be eliminated. Canon's method for suppressing random noise is called complete electronic charge transfer, or complete charge transfer technology, and ensures that the sensor resets the photodiodes that store electrical charges.

NMOS vs. CMOS?

The chips that Olympus calls ***Live MOS*** are actually NMOS technology chips used by Olympus and other members of the Four Thirds consortium. They are CMOS chips that combine some of the advantages of CCD with those of CMOS. NMOS (negative-channel metal-oxide semiconductor) is a type of semiconductor that is negatively charged so its transistors are turned on or off by the movement of electrons. By contrast, PMOS (positive-channel metal-oxide semiconductor) works by moving electron ***vacancies***. NMOS is faster than PMOS.

Noise-reduction software

Both Adobe Photoshop and Lightroom have built in noise-reduction features; for some shooters, that may be all they need. If you need more, it's time to bring out the *power tools*. These are small bits of software that can be Photoshop-compatible plug-ins, Photoshop Actions, or graphics utilities that make a digital photographer's life a little easier for creating practical or special effects. In the same way that an electric screwdriver makes household projects faster than using an old-fashioned hand tool, software power tools let you produce imaging projects quicker and with less fuss than doing it "the hard way."

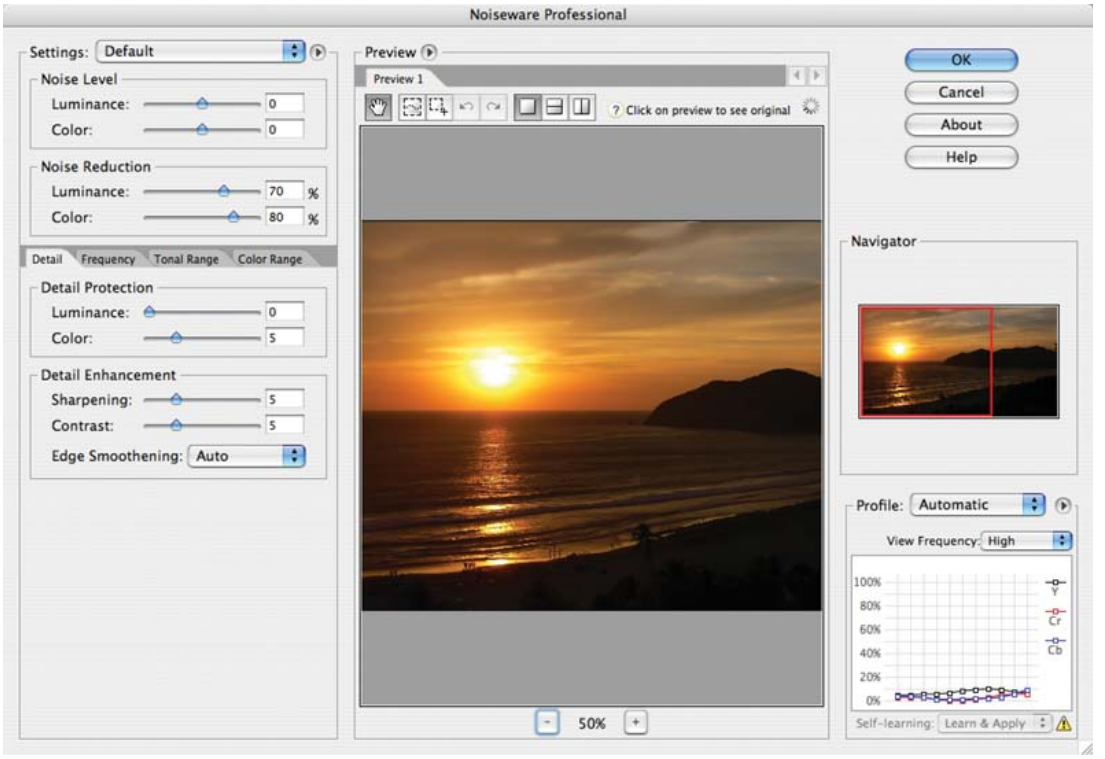


Adobe Photoshop's Reduce Noise filter (Filter > Noise > Reduce Noise) is not a bad way to get started in noise-reduction software. If you already own Photoshop, the filter is already there, waiting to be used. If you feel the need for specialized and more-robust noise reduction, you're going to need a ***power tool***. © 2005 Joe Farace.

One of Adobe Photoshop's most useful features is an open architecture that lets it accommodate small software applications—called plug-ins—that extend the program's capabilities. The use of plug-ins lets digital imagers increase the functionality of graphics programs, and allows them to customize their software to match whatever kind of projects they're working on. Don't let the name fool you. You don't need Adobe Photoshop, or even Photoshop Elements, to use compatible plug-ins. Adobe Systems defined the standard, but compatible plug-ins can be used with many other image-editing programs, including Ulead Systems' PhotoImpact, Corel's Painter, PHOTO-PAINT, and Paint Shop Pro. No matter which program's menu they appear under, the interface for the plug-ins that you see in this chapter *remains the same*. Here's a look at several kinds of noise-reduction power tools that you will find will allow you to put together an indispensable toolkit.

Got noise?

Noiseware (www.imagenomic.com) removes high and low ISO noise and JPEG compression artifacts from digital files as well as grain from scanned film. The interface is intuitive and you'll get superb results without reading the Help file. Noiseware has a self-learning mechanism that *automatically* calibrates a noise profile and chooses the optimal noise-removal ettings without requiring camera-specific profiles. The latest version allows detected noise levels to be adjusted by tonal and color range. It preserves image detail based on tonality range and processing to guard against excessive alteration. Noiseware is available for Mac OS and Windows as a plug-in or stand-alone product. Both use heuristic programming that continuously perfects processing. What this means to you is that every time you process an image, Noiseware learns more about your camera or acquisition device.



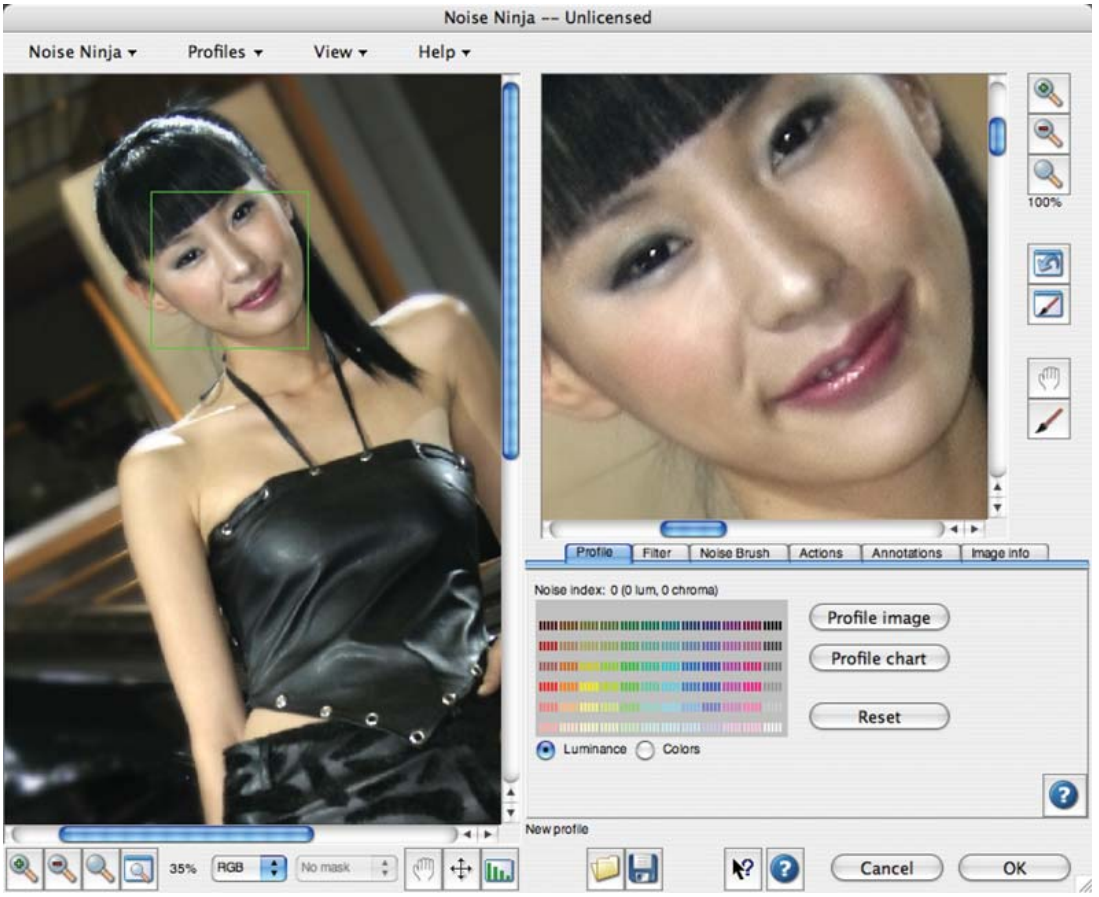
Noiseware Professional uses heuristic techniques to rescue noisy images by learning about your camera or image-acquisition device as it works. It removes high and low ISO noise and film grain from scanned images, JPEG compression artifacts, and moiré patterns. © 2005 Joe Farace.

I used Noiseware to tweak the noise from this available light portrait of Kelli, who reminds me of a young Kathy Ireland. Imagenomic also makes a Photoshop-compatible plug-in called Portraiture that is a combination of noise reduction ***and*** skin smoothing. If you do lots of portraits, that's a product you might want to take a look at too. © 2005 Joe Farace.

Picture code

Noise Ninja (www.picturecode.com) runs on both Windows and Mac OS X, and is available as a stand-alone application or plug-in. The $69.95 Pro Standalone version works with 16-bit TIFF files (48 bits per pixel) and supports batch processing and multiprocessor computers. The 8-bit Home Standalone version costs $34.95. (The plug-in version costs ten bucks more.) Noise Ninja uses a proprietary type of wavelet analysis that avoids introducing artifacts that can cause blurred edges. It includes a set of tools for automatic and manual noise analysis, and a "Noise Brush" that lets you undo or redo the effects of noise removal in the luminance, chrominance, or all color channels. PictureCode recommends that photographers use Noise Ninja even if an image was shot at a low ISO setting, because they claim you'll be able to make *larger* enlargements before noise becomes a problem.

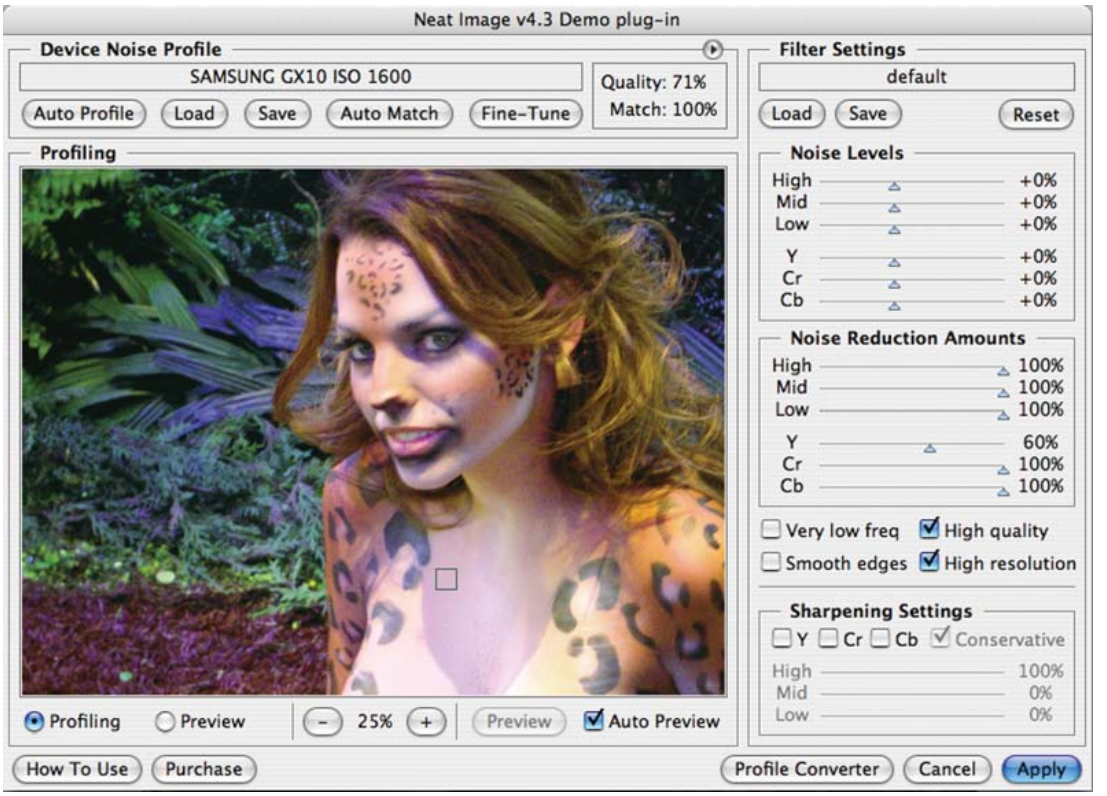
PictureCode's Noise Ninja uses a proprietary type of wavelet analysis that avoids introducing artifacts, such as ringing or blurring edges, to the final image file. To refine its noise-reduction capabilities, the software also uses camera profiles that are offered ***free*** on its Web site. They also offer a profiling chart that lets you build your own profiles. © 2005 Joe Farace.

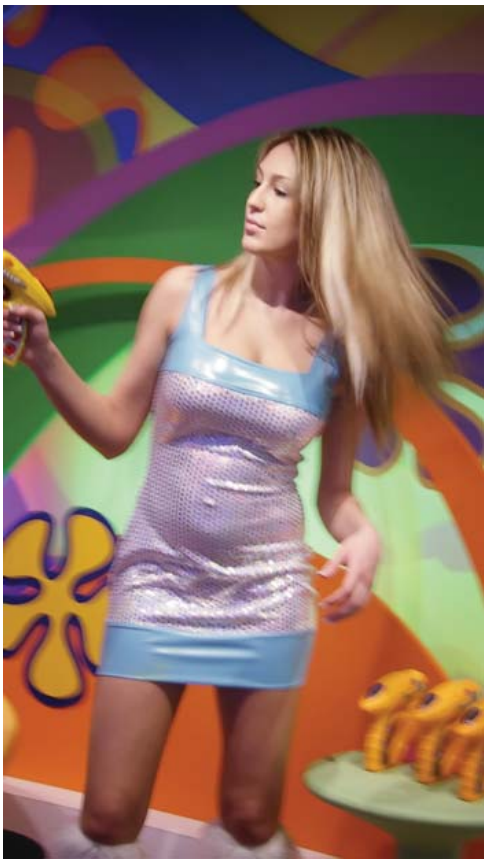


Keepin' it neat

Neat Image (www.neatimage.com) is available as a stand-alone application or as a plug-in. It uses noise-reduction algorithms that are developed specifically for digital photography applications by a "highly-qualified professional image processing research group." These algorithms are claimed to surpass the quality of classic noise-reduction methods, and even that of the wavelet-based methods. Neat Image builds and uses device noise profiles to adapt noise reduction to imaging device. A device noise profile is a reusable analysis of noise properties of an image-acquisition device (digital camera or film scanner) working in a certain mode. Neat Image lets you build noise profiles either automatically or manually: Auto Profiler provides the easiest and quickest way to automatically build a noise profile in just one click, or you can also manually select an image area for analysis and let Neat Image do the rest. Profile Matcher will automatically select the best matching noise profile from a ready-made set using the EXIF data of the input image. You can manually select the desired noise profile as well, or rely on the default filter settings, or manually adjust the filters. You can easily save and later reuse both noise profiles and filter settings.

Although wavelet-based methods of noise reduction were developed only 10 to 15 years ago, Neat Image uses an even newer and more efficient approach to noise reduction. This approach enables drawing a clearer distinction between noise and details in noisy images.



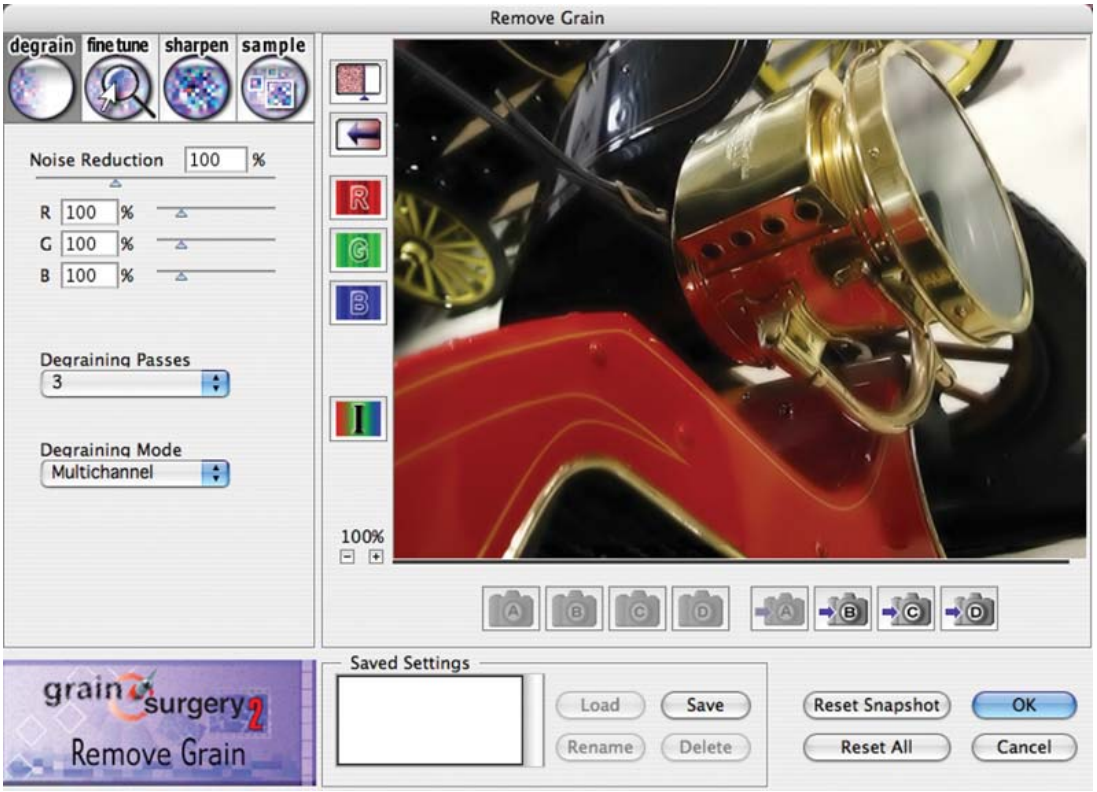


Combining the high-noise-inducing elements of slow shutter speed (1/6 sec) and high ISO setting (1600) and shot under low available light on the floor of a photographic trade show, this image has digital noise written all over it. Final exposure was 1/6 sec at f/13, and what minimal sharpness appears was obtained because the Samsung GX-10 used has ***image stabilization*** (See Chapter 5) built into the camera body. Neat Image noise-reduction software was used to minimize the digital noise and produce a more than acceptable result. © 2007 Joe Farace.

The Home version costs $29.90; the Pro version, which provides full support for both 24- and 48-bit images and works with Photoshop Actions, costs $59.90.

Visual infinity

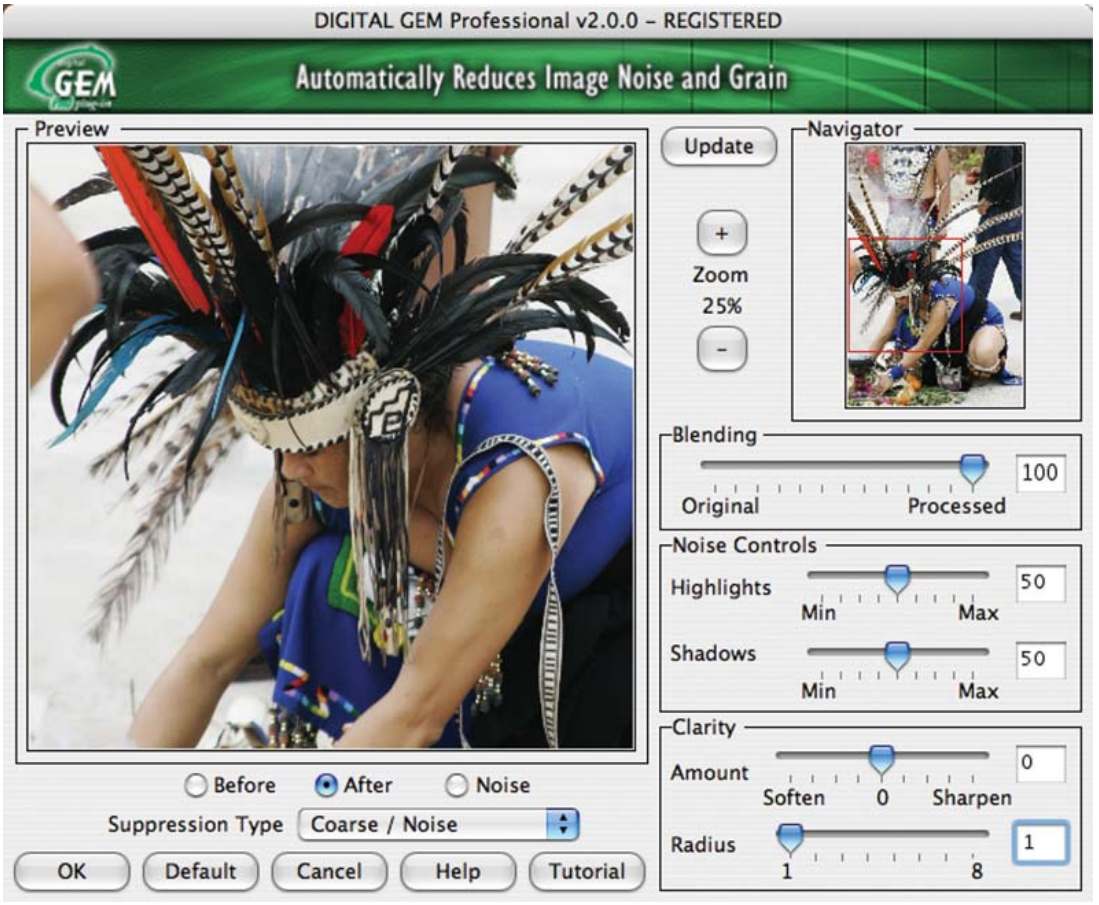
Grain Surgery (www.visinf.com) can reduce digital noise and film grain. This is an industrial-strength plug-in and is priced like one ($179). Grain Surgery cleans up digital noise and film grain, reduces JPEG compression artifacts, and removes halftone patterns from scans. The interface provides easy access to all settings, provides a useful split-window preview, and lets you save settings to reuse them later. You can also add grain, and the plug-in ships with presets for common film stocks. A Sample Grain module lets you create and manage custom grain libraries pulled from your own images. The Auto Match Grain module has one-click duplication of grain from film, like Ilford's 3200, a personal favorite.



Grain Surgery reduces digital noise ***and*** film grain, reduces JPEG compression artifacts, and will even remove halftone patterns from scans. The interface provides easy access to all settings, provides a wonderfully useful split-screen comparison window, and lets you save your settings and reload them later for similar image files. © 2006 Joe Farace.

Applied Science Fiction

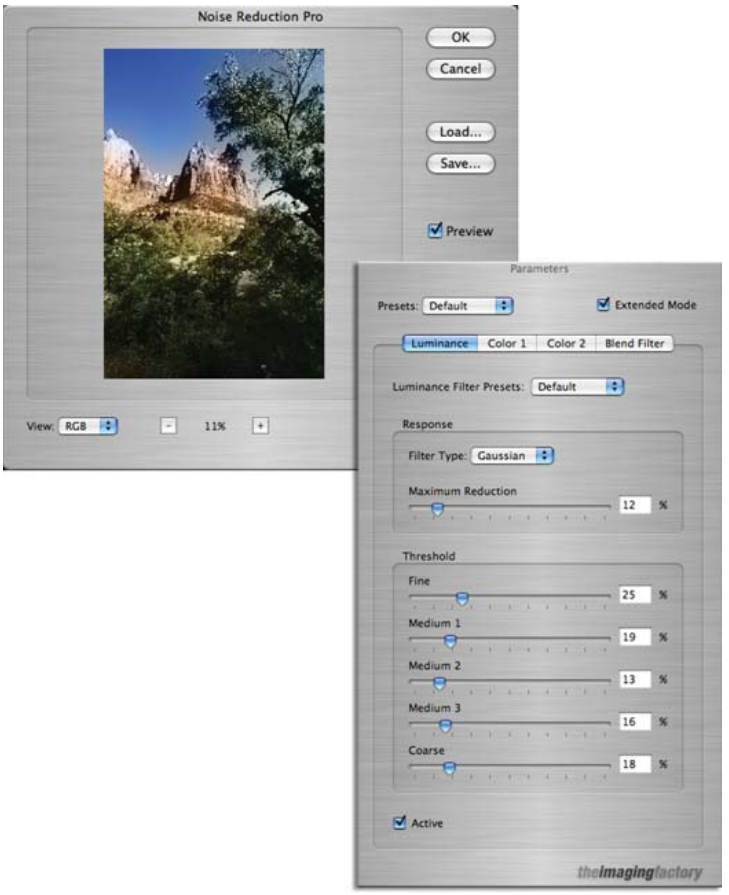
Kodak's (www.asf.com) Austin Development Center offers a $99 Digital GEM Professional Photoshop-compatible plug-in that supports 16-bit color images and provides Coarse/Noise and Fine/Grain noise suppression. Each algorithm is customized for different types of image noise and grain, and has separate controls. The Coarse/Noise is aggressive and works better for extreme noise problems. Fine/Grain is not as aggressive, and is tuned to remove grain as well as noise while preserving detail. Digital GEM Pro offers a Noise Preview Screen that lets you view the noise or grain you want to reduce. Adjustments can be made to define how much noise/grain versus image detail you want to change. You can then toggle back and forth between Before, After, and Noise Preview screens, and make adjustments to see the how the plug-in can improve the image.



Eastman Kodak's Austin Development Center offers a $99 Digital GEM Professional plug-in that supports 16-bit images produced by high-end digital capture devices. The Clarity control in its dialog box lets you customize the effects by providing additional sharpening or softening to the overall image, and a Radius slider controls the area of surrounding pixels that are affected by the sharpening/softening. © 2005 Joe Farace.

The Imaging Factory

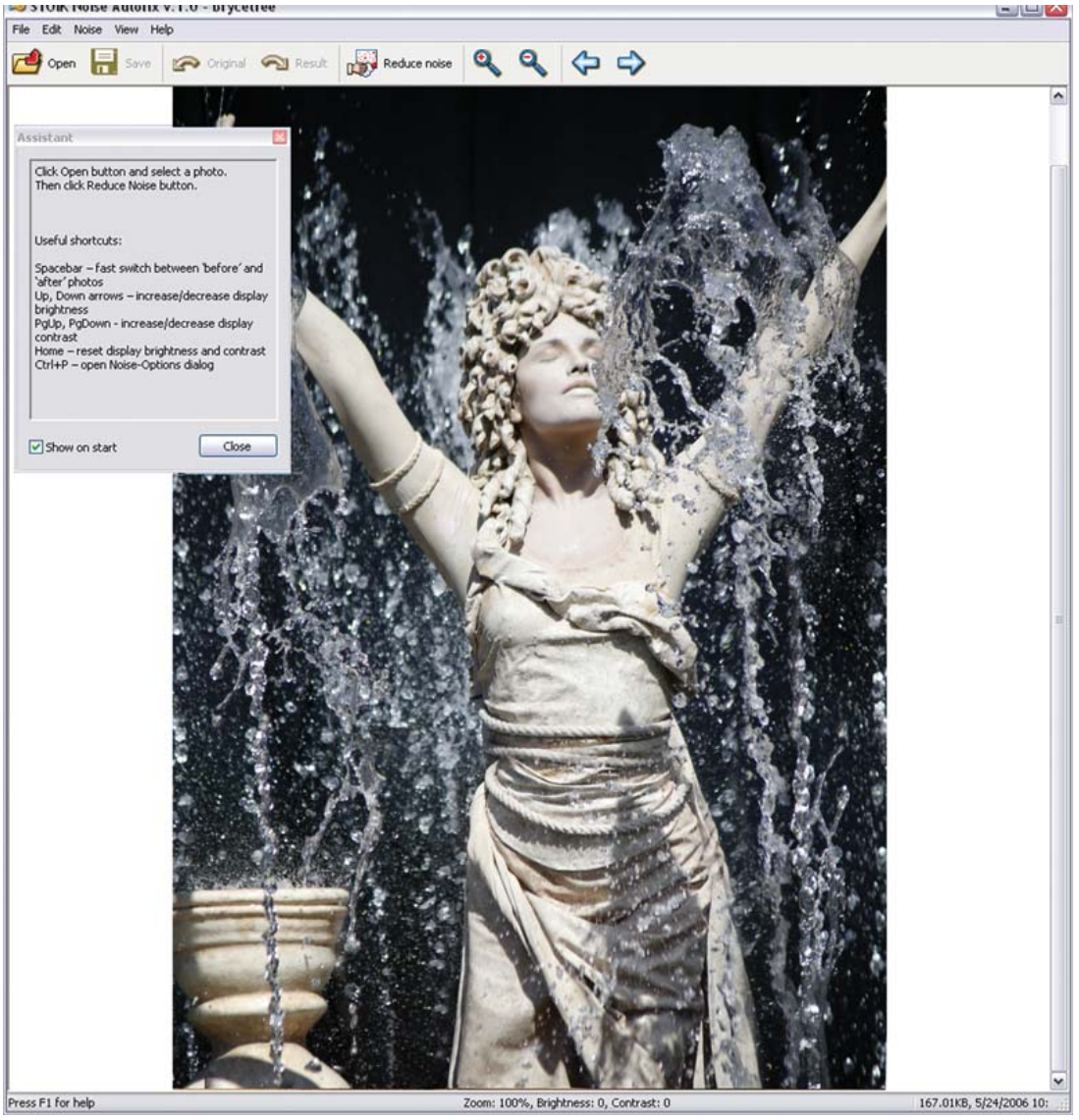
For less than a hundred bucks, Noise Reduction Pro (www.imagingfactory.com) reduces ISO noise, CCD color noise, JPEG artifacts, and color fringing. The latest version of the plug-in uses a redesigned and extremely fast engine that favors 16-bit processing. It has a resizable window offering a live, preview image, and is scriptable via Photoshop's Action palette. Unlike the non-Pro ($39.95) version, it features separate controls for luminance and color noise. Which version do you need? Download 30-day demo versions of both plug-ins and try them both. Although future development of Noise Reduction Pro has been stopped, the product represents an affordable and effective tool. Depending on when you are reading this, the site may not be available and that would be too bad.



For less than a hundred bucks, Noise Reduction Pro features separate controls for luminance (brightness) and color noise. Noise Reduction Pro is not the strongest grain-removal product available, but its application avoids the mushy look that some noise-reduction solutions produce. © 2005 Joe Farace.

Stoic STOIK

Noise Autofix (www.stoik.com/stoik_noise_autofix/index.html) from STOIK is Windows-only software that automatically cleans noise in photographs. The program's detection, analysis, and filtration modules provide optimal balance between noise reduction and image-detail preservation. STOIK claims that the noise in digital photos can be reduced by two to three stops, so the noise levels of the photo shot at ISO 1600 is effectively reduced to ISO 200–400 levels. You can take it out of Automatic mode using controls that allow manual fine-tuning to change noise detection and adjust image-detail-preservation levels or noise-reduction amount. Noise Autofix imports 24- and 48-bit color JPEG, TIFF, PNG, BMP, and PSD files, and outputs JPEG, TIFF, PNG, and BMP formats while preserving EXIF data. A 15-day demo is free, or you can purchase it for $29.



STOIK Noise AutoFix uses adaptive algorithms, image representation, and statistical methods to achieve its noise correction. The main internal modules of the software include Noise Detector, which is based on a Bayesian classifier that was trained to distinguish typical noise patterns from image textures and fine details. It also includes Noise Analyzer to build noise profiles and calculate filter parameters according to statistical image-quality criteria, and a noise-suppression filter is based on multiresolution image representation and statistical decision-making procedures. © 2006 Joe Farace.

Noise in motion

When trying to sharpen photos that have either out-of-focus blur or camera shake, noise can be a problem. If you run a noisy image through a normal Unsharp Mask–based sharpening program noise increases significantly. That's when you need a

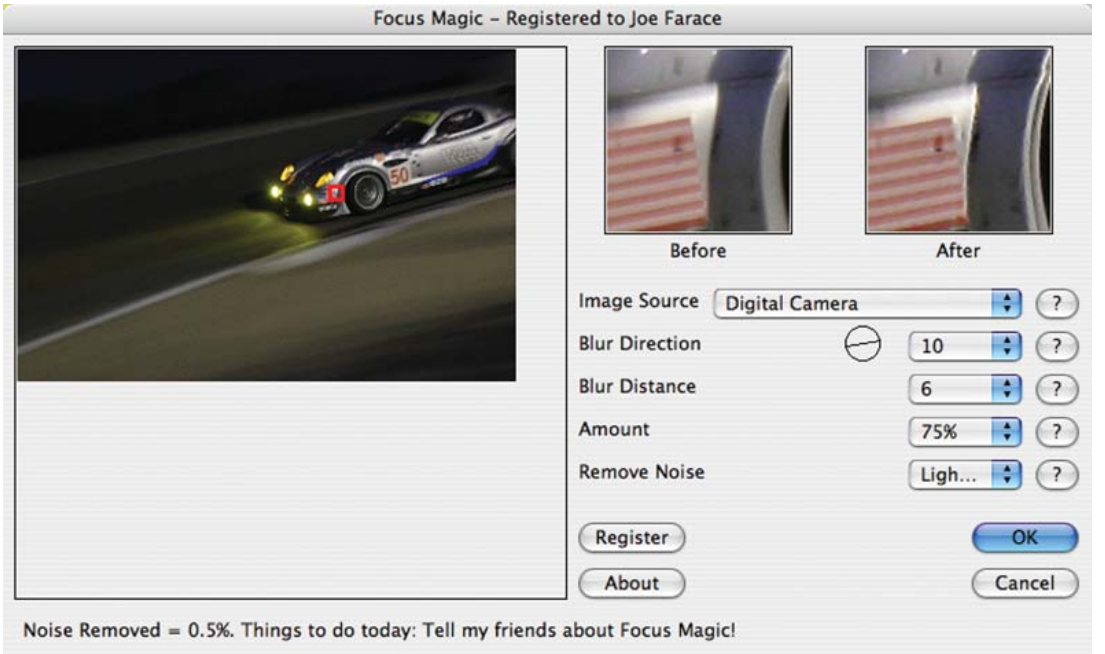
power tool, such as Focus Magic (www.focusmagic.com), that can handle both problems.

When working with a noisy image that is also blurred, Focus Magic looks through the noise and sees the underlying image. It does this by knowing that when an image is out of focus, the image can have only gentle gradients—and the more out of focus the image, is the gentler the gradients must be. Using this information, Focus Magic differentiates between noise and image. The amount of noise removed is displayed at the bottom of the dialog box each time you refocus a small test area on the image, and this noise is removed before the image is sharpened.

The noisiness of the image is taken into account during the sharpening of the image. The Image Source control determines how aggressively or conservatively the focusing algorithm should be in deconvoluting the blur, and takes into account the nonlinear properties of the capturing device, whether it's a CCD/CMOS sensor for a digital camera or film. For nongeeks, *deconvolution* is an image-processing filter that uses Fourier transform mathematics to restore a blurred image as nearly as possible to an unblurred state.

Although Focus Magic isn't designed to be a noise-removal tool, you can use it to remove noise, only as follows:

If you run a noisy image through a normal Unsharp Mask–based sharpening tool, noise increases significantly. That's when you need a power tool, such as Focus Magic, that can handle both problems. © 2004 Joe Farace.



Step 1: Open the image and open Focus Magic for Out-of-focus Blur.
Step 2: Set the Amount to zero. The Amount is the amount of focusing to be applied, so if it is set to zero, only the noise-removal algorithm runs.
Step 3: Set Remove Noise to Yes.
Step 4: Slowly increase the Blur Width and see what happens. You will see the image get smoother and smoother as the Blur Width gets bigger, but you will also see that the filter starts removing more and more artifacts (or image detail), something that is not possible in an image for that blur width.

This image of a race car made during a night race at Laguna Seca Raceway had all of the ingredients of a noisy image. Exposure was 1/20 sec at f/8 and ISO 800, and an on-camera flash was used. Neat image was applied to a separate image, then that duplicate layer was faded 50 percent to maintain some detail. ***Tip***: Shooting at any racetrack, especially at night, can be dangerous. Make photographs only in designated areas, and if you use flash, make sure that you fire it only at the ***side*** of the race car. Using flash when a car is coming directly at you is foolish, and places you and the driver in serious jeopardy. He or she has enough to do without being blinded by your flash. In this case, Joe "dialed down" the Canon 550EX flash by –1⅓ stops, further reducing the impact of the flash on the driver, while providing only some fill flash and making the reflective decals on the car "pop." © 2004 Joe Farace.

Tip: Applying DNR Using Layers

No noise-suppression software solution is perfect, and althoughyou may try hard—working through the many options, choices, and sliders of the software shown on these pages to produce "perfect" results—you may never achieve digital noise nirvana. More often than not, you will obtain an image that is ***too smooth***. When that happens to Joe (in Adobe Photoshop), he uses the History palette to Undo the noise-reduction power tool, and then creates a duplicate layer (Layer > Duplicate Layer). Next, he applies that somewhat oversmooth effect to the duplicate layer. Finally, he goes to the Layers palette and changes the Opacity of the noise-reduction layer to 50%, effectively blending the noisy original with the smooth duplicate. Just because he uses 50%, doesn't mean ***you*** have to. Experiment to find what works best for ***your*** photographs. Then flatten the file, and "Bob's your Uncle."

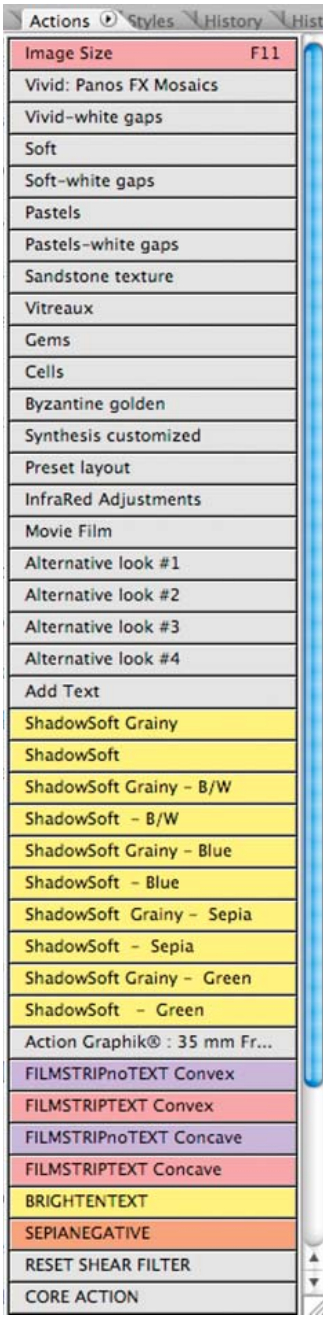
Taking action against noise

Photoshop Actions are not applications or even plug-ins; they are simply a series of instructions that direct the host program to produce a desired effect. The Photoshop Actions palette lets you record a sequence of image-editing steps that can be applied to a selection in an image, to another image file, and to a batch operation to hundreds of different image files. Actions are cross-

platform and can be shared with others. If you create an Action on your Mac OS computer, anyone using the Windows version of Photoshop can load and apply your original Action to his or her images. In Mac OS or Windows form, Actions files use the .atn extension.

The Actions palette (Windows > Actions) is your key to creating and using Photoshop Actions. The palette has two modes: List

Before you can record an Action, the palette must be in List View. To do that, access the Action menu and deselect Button Mode. To play an action, no matter where it came from, the Actions palette must be in Button Mode.



View and Button. List mode lets you create and edit Actions starting with the New Action command that's accessed from the fly-out menu in the upper right-hand corner of the palette. Choosing "Button Mode" from the same menu activates playback or Button Mode.

To create a New Action, click the Record button from the fly-out menu. The circle icon at the bottom of the Actions palette will turn red. At that point, work through a series of manipulations on an image or portion of an image. When you're finished, click the Stop button (the square icon) at the bottom of the palette. Afterward, the order in which tasks are executed can be edited by dragging-and-dropping in any order you wish. Although Actions apply creative effects, they are not filters and don't have to be treated like plug-ins. Because the Actions palette is scrollable, you should keep all of your favorite Actions stored there, ready for use. The trick is not to blindly accumulate Actions, but to explore and test to find ones that fit the way you work. If you uncover a marginal Action, you can store it in an "Inactive Actions" folder or dump it in the trash can or recycling bin.

A good source for *free* or shareware prerecorded Actions is the Adobe Studio Exchange (http://share.studio.adobe.com). Others sources include ActionCentral (www.atncentral.com) and deviantART (www.deviantart.com), which uses a uniquely visual method of displaying their Actions. Because most Photoshop Actions are less than 10K, you don't have to be worried about download time or hard-disk space.

TLR Digital Noise Reduction (http://www.thelightsrightstudio.com/TLRDigitalNoiseReduction.htm) is a set of Photoshop Actions for reducing noise in digital images. The Actions are nondestructive because all of the work is done on layers. The layers have less than 100 percent opacity, so you can adjust the effect. The Actions work with RGB, CMYK, LAB, and grayscale images. They are compatible with Photoshop CS/CS2 and earlier versions of Photoshop. In Photoshop CS/CS2, the actions are placed in a Layer Set/Group to make them easier to manipulate.

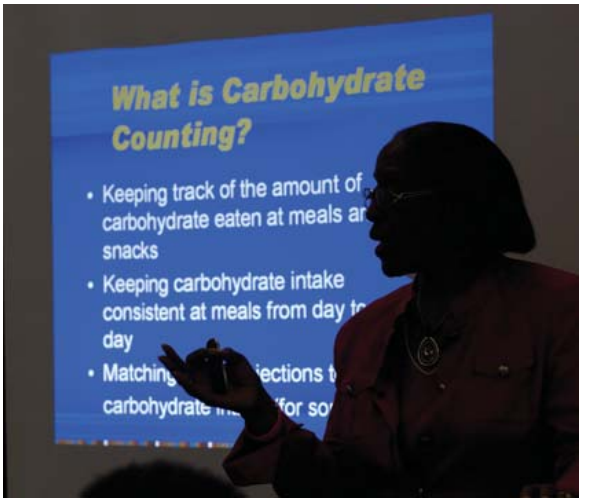
The Actions in TLR Digital Noise Reduction use a more sophisticated method of noise reduction than the well-known ways of handling noise that involve blurring the channels in the image or averaging pixel values. TLR starts with a mask to preserve image details. A duplicate of the image is converted to 8-bit grayscale to speed mask generation. The mask is used to preserve image detail. There are ten progressive levels of digital noise reduction available, as well as a manual action where you control the settings from mask generation to noise-

reduction parameters. TLR Digital Noise Reduction is shareware; if you find the resources helpful, you should make a donation via PayPal.

Noise in print

The amount of acceptable digital noise is subjective, like so many other aspects of photography. Here's a fun test, guaranteed to raise the noise level in a room: assemble several photographers, show them photographs with a variety of different noise levels present, and ask for opinions. What's acceptable to one isn't for all. The same holds true for publications. Newspapers, printed on newsprint, of course, can accept more noise in their images than can a magazine printed on higher-quality paper. This is because the newspaper press uses a line screen of around 85 lines per inch. The paper absorbs and tends to spread the ink from the printing press more readily. Most magazines and other publications use higher-quality and a finer-line screen, which produces crisper, sharper images. If these publications showcase the good qualities of an image better, it makes sense they'll highlight an image's imperfections better as well.

Barry was fortunate to have been working at the *Denver Post* when the digital revolution was really taking off. The paper supplied him with camera, lenses, speedlights, and great training in their use. When he returned to his own photography business full-time, he was up to speed on the technology. This advantage had its drawbacks, however, because many corporate and editorial clients were afraid to accept digital files. The most common excuse: "We have a digital camera and the pictures from it are horrible, so we still hire only film-based



Instructor, silhouetted against the screen where her PowerPoint presentation is being shown. Her hand gesture and profile stand out nicely against the graphic visual, but there is digital noise caused by low light and high ISO. Barry has a new "best friend" in noise reduction: Adobe's Lightroom software, which was used to reduce noise before this image was sent to his client. © 2006 Barry Staver.

Another silhouette example, this time showing a technician working at an electron microscope. Digital noise isn't as pronounced because the ISO isn't too high. A speedlight was fired remotely from the left, illuminating the back wall so the subject stood out. © 2005 Barry Staver.

photographers." Seems that in efforts to save money, lots of folks bought cheap point-and-shoot cameras for the office staff to use. Sure enough, these cameras and inexperienced users produced noisy, pixilated, poor-quality images, making the photographs in their publications look amateurish at best. Barry succeeded in convincing his clients, with one exception, to trust his knowledge and confidence in digital photography. On more than one occasion, he guaranteed that the photographs would reproduce to client expectations or they'd be free.

Our take on noise

Have you embraced the aesthetics of noise? Why don't we just live with digital noise as we did the pronounced grain of high-speed films? Heck, have you embraced the look of film grain? The secret to avoiding noise is to always shoot at the lowest possible ISO speeds and use the highest possible shutter speeds. When working under low-light conditions, this becomes a photographic oxymoron equivalent to "a fine mess." The main thing to remember about dealing with noise echoes is something the late Eddie Bafford once told Joe that about working in the traditional darkroom: "You need somebody standing next to you with a 2 × 4 to whack you 'upside your head' if you get too carried away." That's true for digital noise removal too.

Digital noise be damned when there's a total lunar eclipse on the horizon. We think you'll agree that the thrill of chasing ***The Golden Hour*** and other special lighting times is worth the sacrifice of lost sleep, missed meals, and a non-8-to-5 work schedule. Barry had been burning the candle at both ends teaching the ***Shutterbug*** magazine workshop in Arches National Park when he learned that the moon would totally eclipse later the same night. He summoned the students from the Moab, Utah motel and they returned to Arches. Balanced Rock again seemed to be the best object for foreground interest. This photograph was taken in 2004, and prints made then show a great deal of noise in the foreground. Reworking the RAW files (see Chapter 8) with today's software shows a marked reduction in the noise.

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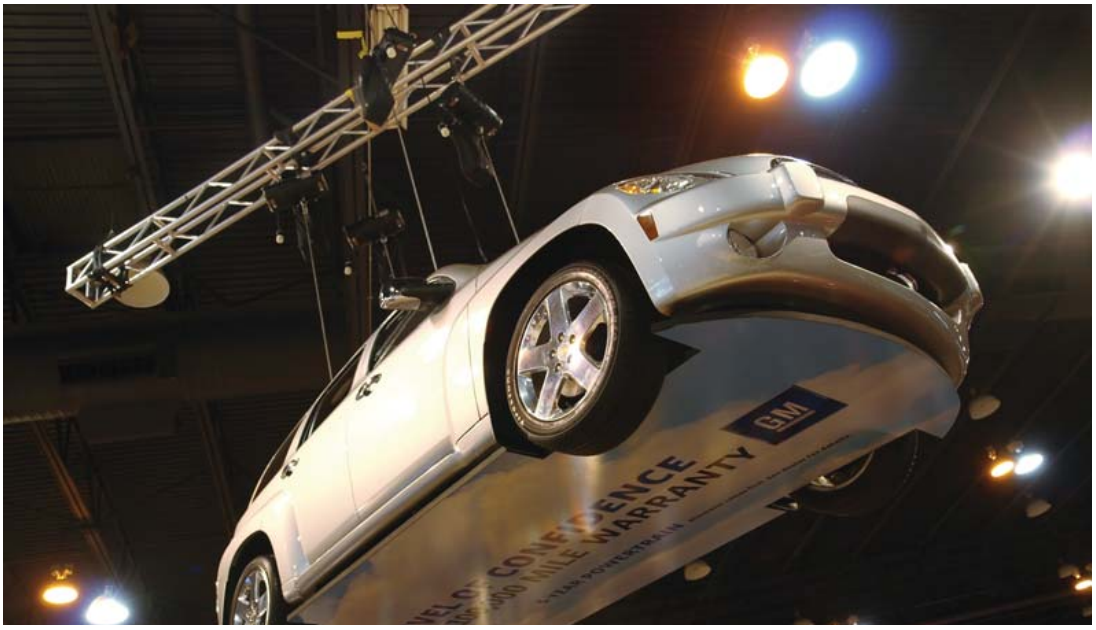
4 White balance techniques



Light is an interpretive tool in the hands of a photographer. He can make it harsh or soft, revealing or concealing, flattering or libelous. The more he knows about the versatility of light, the easier it is to cope with any picture-taking situation he encounters.

—Peter Gowland, 1960

Most of us think about daylight as the "proper time" for making photographic exposures, and many photographic opportunities at night or late in the day are often overlooked. They shouldn't be, but even all colors of daylight are not the same. Most people look at *The Golden Hour* and see the beauty of the subject, no more and no less. You'll hear people offer comments such as, "The sunrise was just beautiful," or, "Look at the golden glow in that portrait," or maybe, "What a romantic sunset." To work successfully in low light, we need to know more about the nature of light so we can digitally capture images that others merely give a fleeting look.

Photographing in museums, such as the San Diego Automotive Museum, can be a challenge because of the kind of mixed-lighting conditions that exist. Exposure was 1/15 sec at f/4.5 at ISO 400. Understanding the concepts behind White Balance and the many options that are available to digital photographers make sure that this white vintage Indy racer is really white. That's what this chapter is all about. © 2006 Joe Farace.

Light is light?

Light may be light, but it's not always the same color. The color temperature emitted by various light sources is measured in degrees on the Kelvin scale. (See "Who Is This Kelvin Guy?") The sun on a clear day at noon is 5500 K. On an overcast day, the color temperature of light rises to 6700 K. You will experience 9000 K in open shade on a clear day. When we photograph that special sunrise, its color temperature may be well *down* on the Kelvin scale—to about 1800 K. Lights used by videographers or tungsten light lightbulbs used in so-called "hot lights" have a Kelvin temperature of 3200 K. The light from household lamps is close to that color temperature, measuring about 2600 K.

One of the toughest light sources to Color Balance is *fluorescent*. The type and age of each tube in a fixture affect color and film cameras usually require special filtration to produce an image that looks neutral. Filters may be helpful in correcting the light's color, but they also darken the viewfinder, making it harder to focus and compose the image, and they increase exposure time. With digital cameras, all that's changed.

Who Is This Kelvin Guy?

I am constantly amazed at the misinformation I hear about the Kelvin scale. On the Internet, a power company states that the "History of Kelvin temperature originally comes from the incandescent lamp." Duh? Long before Edison invented the incandescent light, William Thomson (Lord Kelvin), an Englishman, proposed a new temperature scale suitable for measuring low temperatures. During the 19th century, he suggested that absolute zero should be the basis for a new scale. His idea was to eliminate the use of negative values that occurred when measuring low temperatures using either Fahrenheit or Celsius scales. In honor of Lord Kelvin's contributions, this system is called the Kelvin scale and uses the unit "kelvin" (lowercase), which is abbreviated "K" and is used without the degree symbol or the word "degrees." Another unit of color that you might see occasionally is the ***mired*** (micro reciprocal degrees), which is a unit of measurement equal to 1 million divided by the color temperature, and is used to indicate color-correcting filter densities.

In the film era, this scene lit by fluorescent light may not have been successfully made, Color Balance wise. Skin tone, light hair color, and the white paint would have definitely gone green. The photographer would have had to filter the camera lens, filter the fluorescent bulbs themselves, or use artificial light strong enough to overpower the available light. In the film days, these techniques worked well ***if*** the photograph could be set up or planned in advance. Can you imagine telling this youngster, and the other kids in line, to wait for their face painting while the photographer fiddles around with lighting? This was a grab shot, with no time to do any of the filtering work. It was easy to set the camera's White Balance to Fluorescent and concentrate on capturing the moments. © 2006 Barry Staver.

Color Temperatures of Common Light Sources

Light Source	Color Temperature (K)
Skylight	12000 to 18000
Overcast sky	7000
Average daylight	5500
Electronic flash	5500
White-flame carbon arc	5000
500-watt, 3400 K photo lamp	3400
500-watt, 3200 K tungsten lamp	3200
200-watt lightbulb	2980
100-watt lightbulb	2900
75-watt lightbulb	2820

Real-world color balance

The preceding color-temperature chart places many interior artificial light sources along its value line. You will notice that household lightbulbs and tungsten lights (usually little spotlights in track lighting) fall below the Kelvin temperature of daylight. Fluorescent tubes (becoming more popular by the minute), mercury-vapor, sodium-vapor, and metal-halide lights are not even on the chart. That's because their color temperature can vary from 1900 K up to 8000 K depending on several factors, including the age of the bulb. Lastly, don't forget neon signs, lasers, computer monitors, and television screens. All of these devices produce light of different color temperatures. What a nightmare! No wonder many of us are unhappy with or don't pursue available low-light photography.

In the past, you used film or filters to help match the color temperature of the existing light, but all that's changed with digital SLRs. Unlike film, which has one—count 'em, one—Color Balance per roll, your digital SLR (and even most point-and-shoot digicams) has several that you can change as the lighting conditions change. Built-in color correction has long been a part of shooting video, where the camera's electronic circuits can be set to neutralize whites and other neutral colors without requiring filters. "White Balance" is the term from the video industry that we photographers have been stuck with, and has been with us since the introduction of real color photography in 1938.

In-camera color correction is managed by your camera's White Balance function, a setting that's built into all digital cameras, and uses electronics to neutralize whites and balance colors—without the need for any filters. Digital SLRs work similarly and are, in some ways, better—for example, they can check color temperature using the AWB (Auto White Balance) setting to automatically compensate for the light's color. The camera's White Balance can also be set to specific light conditions, or it can be custom-set for any number of possible lighting conditions. Filters are rarely necessary, making the associated light loss a thing of the past. When set in AWB mode, cameras automatically correct for the light's color, or White Balance can also be manually set for specific light conditions, including Daylight, Shade, Cloudy, Tungsten, Fluorescent, Flash, or Manual.

Auto White Balance is not perfect. Sometimes a scene just doesn't look right if automatically corrected. Applying a neutral balance to a warm sunrise and sunset just looks unrealistic. That's just one reason why Automatic White Balance occasionally produces unacceptable results. If you want the effect of the

The rule of thumb in building interiors seems to be mixed lighting. The more you mix, the better the ambience. Barry wasn't about to miss this moment at a neighborhood health fair, as the chair masseuse got some help from a small pair of hands. Auto White Balance saved the day, despite the tungsten-balanced track lighting (the light streaks down the walls) and the overall fluorescent lighting, most noticeable in the true-white color of the woman's shirt. © 2006 Barry Staver.

Adjusting White Balance settings with the Pentax K100D series of digital SLRs is easy: press the Fn button, then the left-hand button in the four-way controller to see the preset White Balance settings that are available.

warming filter without the hassle, select White Balance in your camera's menus, then scroll through the available choices. On a bright, sunny day, try using the Shade or Cloudy setting to warm up the photograph. Experiment and check your results on the camera's LCD screen.

AWB: color-temperature range of approximately 4000–8000 K

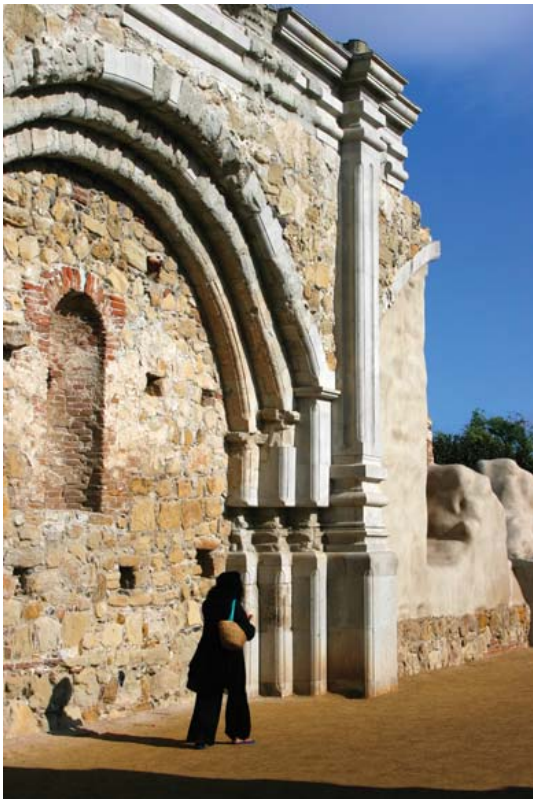
Our eyes are very good at judging what is really "white" under different kinds of lighting conditions, but digital cameras need processors to accomplish the same thing our brain does for us. The camera's AWB setting automatically interprets the light within its range of parameters and adjusts accordingly.

What color is a sunset? You might as well ask, "What's a henway?" (The ***Dumb & Dumber*** answer is: "About 2½ pounds"—although poultry experts tell me 8 pounds is more accurate.) Joe's answer to the sunset question is: "Whatever color you like." This unretouched photograph of the beach in Acapulco was made with a Leica D-Lux 2 digital point-and-shoot camera that has the ability to capture images in HDTV's 16:9 aspect ratio. Exposure was 1/500 sec at f/4 in the camera's Landscape scene mode. © 2005 Joe Farace.

Sometimes this works extremely well. Depending on the mix of light sources, sometimes it doesn't. Often it works better with some lenses than with others and images made with a wide-angle lens may have a slightly different Color Balance than those made with lenses of a longer focal length. Joe's philosophy has always been that when the lighting gets tricky, try AWB first. He is amazed at how often this produces a pleasing Color Balance; if it doesn't, then it's time to look at the other options.

Daylight: approximately 5200 K

This is a bit of a misnomer because the color of daylight changes during the passing of the day, but in this case means that you're shooting "outdoors" and is usually based on midday, which is the worst time of day to photograph anything. Colors perceived under the midday sun usually serve as the standard for color reproduction, and shooting in this mode makes colors look the way they should. If you shoot with the Daylight setting indoors under lighting that typically has a color temperature around 3200 K, the pictures will have a warm, golden look that you might like or hate. So if you don't like the color of the images on the LCD screen, chances are you're in the wrong White Balance mode.



This shot was made in daylight at Mission San Juan Capistrano, but later in the day, at 5:19 p.m., so the colors are slightly warmer than if it had been captured at midday. The drama and the long shadows would have been missing in the flat, harsh midday light. Exposure was 1/640 sec at f/16 at ISO 200. © 2006 Joe Farace.

Shade: approximately 8000 K

If you've been making photographs for a while, you know that shade can add a bluish cast to portraits. That's why many film photographers would use Skylight or warming filters when

This shot was made in the shade along the shoreline of Barr Lake. The lighting is flat, and cooler than a daylight portrait might be. Depending on how accurate reproduction is, Helen's top has blue in the shadows, which is probably also cooling her skin tones. This is the unretouched image with an exposure of 1/125 sec at F/5.6 at ISO 200. © 2005 Joe Farace.

If you don't correct the image's color in-camera by choosing the Shade setting, you're going to have to do it later in the digital darkroom. My favorite tool for this is PictoColor's (www.pictocolor.com) iCorrect EditLab Pro, a Photoshop-compatible plug-in. I clicked on the blue tones in her white top to make it neutralize the color in the entire image file. © 2005 Joe Farace.

The final image is a combination of applying iCorrect EditLab Pro to correct color and some burning and dodging in the digital darkroom to give the image a little snap! © 2005 Joe Farace.

working under these conditions. The Shade White Balance setting accomplishes the same thing by warming up images "made in the shade."

Cloudy: approximately 6000 K

This setting warms up images, too, but not as much as the Shade setting does. In fact, you might prefer to use the Cloudy setting when making portraits in the shade, because the effect is slightly weaker. It's also a good White Balance setting to try for sunsets in order to punch up warm tones. This is where a camera's LCD preview screen exploits the digital advantage by letting you preview all of these kinds of effects as you experiment.

Cloudy, overcast, and rainy days produce soft light; the only problem is that there's not enough of it! This photograph of a Tokyo street was shot at ISO 800, and the use of the camera's Cloudy mode added some warmth that might have otherwise been missing from the scene. Exposure was 1/250 sec at f/6.3 in Program mode. © 2003 Joe Farace.

Fluorescent light

Fluorescent light produces a greenish *X Files* look and some cameras, such as the Pentax K100D series of digital SLRs, offer several options: D is for Daylight (6500 K)–balanced tubes, N works best with Natural White (5000 K) lights, and W is suggested for White (4200 K) fluorescents. Out here in the real world, it's a mix-and-match situation, so many times all three types of tubes will be used in a single light fixture. The best advice is to make a few test shots using each of the three settings to find out which one works best. If you don't like any of them, that's the perfect time to try the camera's Manual setting. All of these White Balance settings have creative uses, too, and any of the Fluorescent options can be used to add a dash of pinkish warmth to sunrise or sunset images.

Working in a factory, you're going to experience lots of mixed-lighting conditions, including fluorescent lighting. Here an on-camera flash was used with a green Sto-Fen (www.stofen.com) Omni Bounce diffuser to balance with the fluorescent light as well as illuminate the undercarriage of this fire truck. Exposure was 1/15 sec at f/11 at ISO 800. © 2003 Joe Farace.

Tungsten light: approximately 3200 K

The Tungsten setting is designed primarily for photography under quartz or photoflood lamps that have a color temperature of 3200 K. It also works well under household lamps whose temperature varies depending on wattage but usually hovers around 2800 K. This setting is designed to cool off the light, and so offers some fun usage such as with snow to add a chilly blue to a scene.

This photograph of Mary Farace was made using only the light from a 50/100/150-watt bulb in a lamp to her right. The soft-focus image was captured using a Lensbaby (www.lensbabies.com) lens mounted on a Canon EOS 20D with an exposure of 1/20 sec at f/4 at ISO 1600. © 2004 Joe Farace.

Mixed lighting outdoors presents a fun situation in the digital world. It's time to experiment, trying different White Balance settings on the camera. "Film is cheap" was a buzz phrase back in the day, referring to the low cost of making a few more exposures in comparison to the photographer's shooting fee. If film is cheap, then digital files are basically ***free***! Borrowing a trick from our architectural photography friends, here's one way to create an interesting twilight image. The camera White Balance is set to Tungsten, correctly balancing the rodeo arena lighting, which in turn renders the evening sky a cool blue. © 2005 Barry Staver.

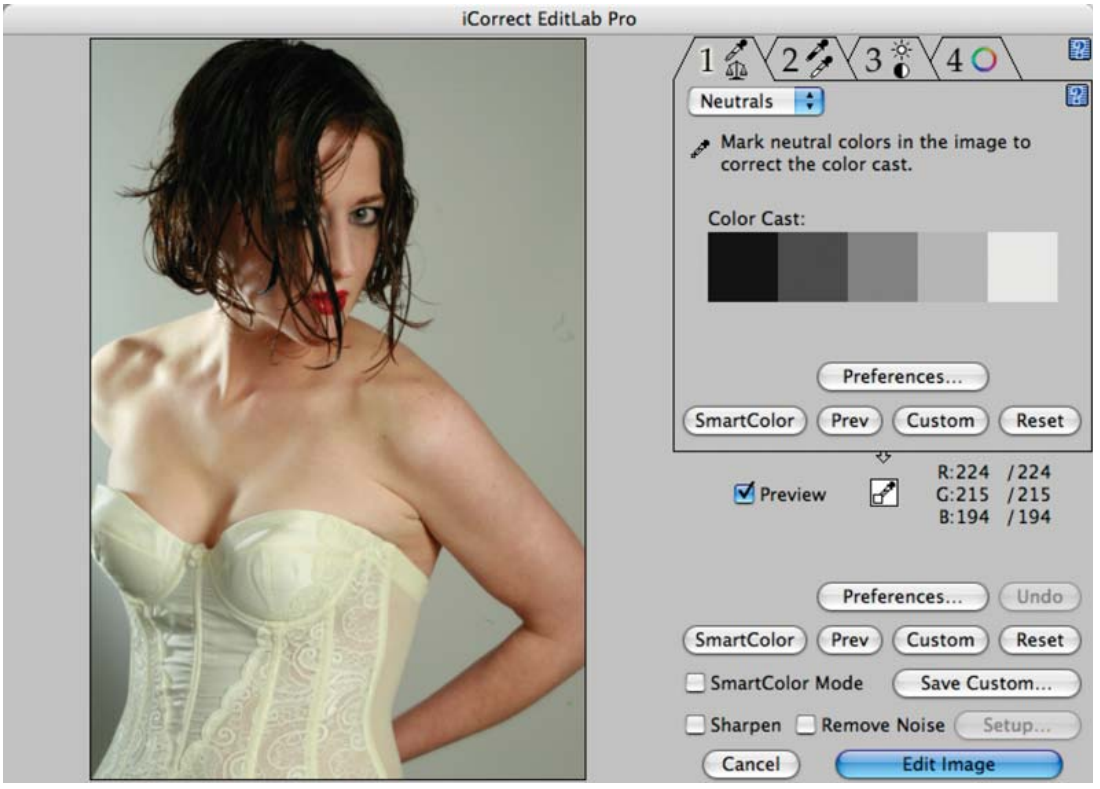
Flash: approximately 5400 K

Light from electronic flash units tends to be cooler than daylight, so you can use this setting to warm up your images. With some digital SLRs, this setting is similar to Cloudy and some photographers use both settings as a form of digital warming filter for

This photograph is the second in a series of studio shots of models wearing corsets. Joe has been making the series as a self-assignment. Exposure was 1/15 sec at f/13 at ISO 200. The photograph was shot in Flash Color Balance, but the gray background was too warm blue. So, in order to produce ***this*** image, he used PictoColor's iCorrect EditLab Pro. © 2007 Joe Farace.

outdoor scenes. But some caution is in order: some camera flash settings tend to be warmer than others. All flash units, even professional studio lights, are not consistent from manufacturer to manufacturer and may not produce the same color temperature, so this is not a one-size-fits-all solution. Shoot some tests and compare settings to find the best Color Balance for your flash.

When the color isn't quite perfect and needs just a little help, I reach for PictoColor's iCorrect EditLab Pro software. It's available as a Photoshop-compatible plug-in or as a stand-alone application, and eliminates the frustration that often accompanies the process of color-correcting photographs. The interface uses a SmartColor Wizard with four toolsets. As you progress through the tabs from left to right, the tools will *not*, and cannot, affect any tools applied on the left. This step-by-step process alleviates the frustration of correcting part of the image while throwing off another. After one pass through the tools, you're finished. You can save custom settings to apply to other, similar images individually or as a batch. Color-correction parameters can be saved as ICC (International Color Consortium) profiles for color-managed workflows.



As you can see, the background looks warmer than the background's true-gray color and the model's skin tone is just a bit too yellow, so Joe used PictoColor's iCorrect EditLab Pro to correct the color. Color correction is simple: he clicked on the background and it was balanced to neutral. © 2007 Joe Farace.

Manual

Then there's Custom mode, which some users might think is difficult to use, but it's not. Under tricky lighting conditions, all you need to do is make an exposure off something that's white. The camera will store that image and use it to color-correct your subsequent images. Although some people look for something "white" in the scene, there are so many interpretations of white paint out there that Joe usually brings his own. The flip side of the Kodak Digital Gray Card (www.larkbooks.com) is white and makes an ideal companion for the photographer interested in making color-correct images, saving lots of time that would be spent later tweaking image files.

Kodak offers a small (4 × 6) gray/white card, but if you are looking for something to perform a Manual Color Balance that is truly pocketable, consider ExpoImaging's (www.expodisc.com) ExpoDisc Digital White Balance Filters. ExpoDisc is a Custom White Balance filter that lets digital photographers improve their color by setting a Custom White Balance without having to carry, hold, position, or fumble with gray cards, white cards, or targets. Using your camera's built-in Custom White Balance capability, ExpoDisc turns your camera into an *incident* color-metering tool. This design enables the ExpoDisc to receive, scramble, and transmit light from a wide angle in front of the disc through to the camera's

Each ExpoDisc is manufactured and individually calibrated by hand to strict tolerances of light transmission and color neutrality. Consisting of multiple layers of carefully selected and matched optical-grade materials, each ExpoDisc is guaranteed for neutrality (+/– 2 percent) for demanding photographic professionals.

image sensor for a faster, easier, and more accurate White Balance correction. This produces excellent results, even in mixed light. Simply place the ExpoDisc in front of your lens, and capture the incident light while setting your camera's Custom White Balance. ExpoDisc Digital White Balance Filters are available with quick pressure release mounts in six standard sizes—58 mm, 62 mm, 67 mm, 72 mm, 77 mm, and 82 mm—and in flats for modular filter systems.

Our friends at ShootSmarter (www.shootsmarter.com) offer another kind of Custom White Balance target. Three different sizes of their Balance Smarter pop-up panels are available to fill the needs of most photographers. Each Balance Smarter has a digital neutral white on one side and a digital neutral gray on the other. The center mark in the middle of each panel is for your autofocus to grab onto so you don't have to turn off autofocus to make a Custom White Balance. The smallest (12-inch panel) is great for on-the-go location photographers, whereas the larger models (20- and 30-inch panels) work well for portrait and studio shooters. The panels have both a neutral white and a neutral gray side, and prices range from $40 to $85.

Color Space

Many cameras also offer a Color Space option that is ***très différent*** from Color Balance. The Color Space options that are available in a digital SLR's custom settings are typically Adobe RGB and sRGB. It seems simple: just pick one. Here's the problem in a nutshell: sRGB (Standard RGB) was created in 1999 with a goal of producing color ***consistency*** between hardware devices. Defining a gamut of colors, sRGB represents each color well and can be used by CRT monitors, LCD screens, scanners, printers, and digital cameras. sRGB has been incorporated into many Web browsers to make sure the colors on Web pages match the color scheme of the operating system. Because of the color consistency it creates, most hardware devices that work with images now use sRGB as the default setting. All of which sounds very inviting, doesn't it?

Adobe RGB is designed for photographers whose work will appear in print, and offers a broader range of colors than sRGB does. If you want to really make yourself crazy, you can Google "sRGB vs. Adobe RGB" and read opinions from a wide range of viewpoints. Being a pragmatist, I suggest you do the same thing with this Color Space argument as you do with the 8-bit vs. 16-bit controversy. Shoot some tests, make some prints, and then decide. This is the way we worked back in the film days, and the methodology is still valid today, even if the tools are a little different.

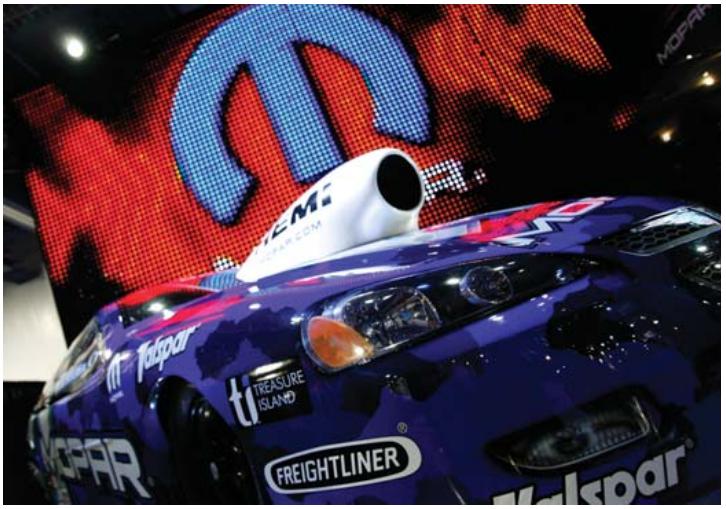
Facing lighting challenges indoors

One of the biggest advantages of digital capture instead of film when working under all kinds of weird lighting conditions is that you can capture and color-correct images *without* using on-camera filters. For many digital SLR owners, the temptation is to set the camera on Auto White Balance and blast away. Most of the time, that's a pretty safe approach. Other times we hear people say, "I'll fix it later in Photoshop," but our answer is, "Why waste time when you can capture it correctly in the first place?" If you're wondering how, here are a few suggestions.

When shooting with available light in this Harley-Davidson dealership, there was more to deal with photographically than just a mix of daylight, incandescent, halogen, and who-knows-what-all lighting. Exposure can be tricky, too, so it's a good idea to switch into Manual mode as Joe did here. Camera was an Olympus EVOLT E-300 with the Digital Zuiko 7–14 mm ED zoom lens at 7 mm. Exposure was 1/30 sec at f/4.0, and even wide open, there's plenty of depth of field. Color Balance was set on Auto, and here it delivered accurate Color Balance without requiring any postproduction color correction. © 2005 Joe Farace.

Auto White Balance (AWB) works most of the time, especially in venues with wildly different kinds of light sources, such as convention centers or athletic arenas. Joe always does a few test shots first to see if the color is close. If that doesn't work, he tries a few *more* tests using some of the other available White Balance options. Be careful of exposure. Under most mixed-light conditions, it may be necessary to increase exposure compensation to produce a bright enough image. Because this is digital, you can

This unretouched digital image of a Dodge HEMI-powered drag racer was made on the floor of the Las Vegas Convention Center. Not only was Joe dealing with the kind of mixed-lighting sources that abound in these environments, but there was also the big LCD screen behind the car, kicking in red and other colors. The Auto White Balance mode for the Canon EOS 5D handled it with aplomb even at ISO 800. Exposure was 1/40 sec at f/40, hence the shallow depth of field. Although the color may not be perfect, it's certainly in the ballpark. © 2006 Joe Farace.



see the results right away on the LCD preview screen, but use the camera's histogram function to check brightness too.

For most photographs, Joe uses the camera's Daylight Color Balance setting. It's obviously the best choice for shooting outdoors, but he also uses it when making window-light portraits indoors. Under these kinds of lighting conditions, this setting creates a warm, romantic effect that we think enhances the portrait even though it may not be "color correct."

There is no correct Color Balance for some shots such as this portrait of Leslie that was made on the loft outside Joe's office. When making window-light portraits with the camera set in Daylight mode, the warm light from late in the day creates a romantic effect that he likes. © 2002 Joe Farace.

The camera's Tungsten setting is amazing; it's like loading a film camera with tungsten color slide film or a forgiving color negative film, such as Fuji 800. When shooting under typical living room incandescent lamps, you may want to shoot a few test shots to see if you have to increase exposure, but the Color Balance should be right on. You can also use it *outdoors* with a filtered flash to create a special effect.

The Cloudy Color Balance setting works great to warm up photographs made on cloudy or overcast days, but can also be used during twilight or evening to keep your images from being too cool or blue. Some cameras offer a Shade setting that's similar to Cloudy but may not be as intense. Joe has found that the Fluorescent setting is a good place to start when an area is lit with fluorescent tubes; because it's built into the camera rather than an on-camera filter with a high filter factor, you can see what you're doing in the viewfinder.

Just because a camera offers a Tungsten setting doesn't mean you can't use it ***outdoors***. This portrait of Mina was made outside on a movie set in Phoenix. The camera was in Incandescent mode, which accounts for the extra blueness of the sky and background, but an orange (85A) Rosco gel was placed over the Canon 420EX flash to keep the subject color correct. This technique takes some practice and success ultimately depends on the flash's power output and how "correct" the gel is to get a specific effect. © 2005 Joe Farace.

This is a photograph of a wall near the lobby of the Hotel Emporio Continental Acapulco in Acapulco, Mexico. On one side of this wall, the lighting was blue; on the other side, it was incandescent. The only way to capture what I saw was to shoot in Auto White Balance mode. Exposure with a Canon EOS 5D was 1/40 sec at f5/6 at ISO 400. © 2006 Joe Farace.

Most digital SLRs have a Flash setting, but when using either on-camera or studio flash units, Joe has found that this setting may be too warm or too cool, depending on the brand of camera you're using. He seldom uses it, preferring to employ the Daylight setting for most flash shots. But don't just take his word for it. Do a few tests. Shoot a neutral-colored concrete floor with flash using Flash, Daylight, and Auto settings and you'll see your particular camera color bias with the Flash setting.

On location

Of the many impacts that digital imaging can have on the *kind* of pictures you make, the biggest must be on low-light photography. Unlike shooting film, the LCD screen on the camera's back provides instant feedback, allowing you not only to make exposure changes, but also to tweak depth of field to get just what you want, as well as Color Balance, with no filters required.

When working under low-light conditions, some things won't change. Slow shutter speeds mean that you need a sturdy tripod, and more often than not, shooting in little or no light means an increase in ISO speeds. With CMOS or CCD imaging sensors, a combination of slow shutter speeds and high ISO spells N-O-I-S-E. Traditional photographers have to cope with grain from higher ISO film, so the trade-off between working with the two media ain't all that different.

Some digital SLRs also let you set specific color temperature in degrees Kelvin. At a fire truck factory in Colorado where Joe was shooting, the color temperature would vary 500–1000 K, depending on where he was standing. The large, colorful vehicles parked all around tossed additional color pollution into the mix just to make it more interesting. Who ya gonna call? Gossen Color-Pro 3F, that's who.

You place the Gossen Color-Pro 3F color-temperature meter in the same position that you would for making an incident light meter reading, push the button, and it displays the color temperature in degrees Kelvin. No translation necessary; it doesn't get much simpler than that. In the film days, Joe would need to have translated that into a color-correction cfilter, screwed it onto the camera (lost exposure due to the inevitable filter factor), and then hoped for the best. With a digital SLR, you can see it now, and the camera even makes tweaks to Color Balance if the camera has built-in Color Balance bracketing, which is a trend today with many SLRs from Canon, Nikon, Olympus, and Pentax.

Outdoor lighting conditions don't get more challenging than this hotel shot of the Paris Las Vegas. One way to deal with this kind of challenge is to use the camera's White Balance bracketing feature. The Canon EOS 5D, used for this handheld photo, offers plus or minus nine levels of Color Temperature Compensation with a Blue/Amber or Magenta/Green bias. Other cameras, such as Nikon's D2x, offer White Balance bracketing of two to nine frames, adjustable in 10, 20, 30 mired steps. The Pentax K10D has Color Balance bracketing through an extended bracketing menu. The Olympus EVOLT E-500 offers Red-Blue/Green-Magenta color bracketing at up to +/– seven steps in each two mired steps. © 2006 Joe Farace.

Indoors at this fire truck factory with all the building's lights turned ***off***, Joe shot this truck illuminated only by its own emergency lights. He tried several different Color Balance settings and settled on Tungsten. You may prefer something different, so put your camera on a tripod and try each of the various Color Balance settings that your digital SLR offers. Exposure was 1/45 sec at f/16 at ISO with a Canon EOS 10D. © 2004 Joe Farace.

The Gossen Color-Pro 3F is specifically designed for measuring the photographic color temperature of flash or ambient light, and indicates the measured results in degrees Kelvin (K).

Flexibility isn't just a term applied to yoga practitioners, but stretches to fit photographers as well. Barry's intention on every assignment is to achieve correct Color Balance in-camera, avoiding the costly postproduction time spent correcting bad color. The color-temperature meter or Custom White Balance panels mentioned above will do this. Enter the real world—in this case, an operating suite in the Health Sciences Center at the University of New Mexico in Albuquerque. After suiting up in surgical scrubs, he was escorted into the room with surgery already in progress. It's doubtful that anyone in the room would have appreciated a request to approach the sterile field to take color-temperature readings, let alone that they would have understood the need to hold up a Custom White Balance device above the patient. Several test shots were quickly taken using different White Balance settings. Barry reviewed each on the camera's LCD screen, chose the one that looked best, set the camera accordingly, and completed the assignment, knowing that some tweaking would be required in postproduction. © 2006 Barry Staver.

Black and white?

One way to completely avoid the problems associated with Color Balance is to shoot in black and white. O.K., you say, "That's cheating"—but where does it say that available light photographs have to be made in color? Many digital SLRs have built-in Monochrome modes. Some even have modes that enhance gray tones while making the color less vibrant, creating an old-fashioned, even hand-colored look—all in-camera.

Canon, Fuji, Nikon, and Olympus SLRs are not unique in having a Monochrome mode; just about everybody's point-and-shot digicams offer something similar. The Nikon D40x has a Retouch menu that offers exclusive in-camera image-editing features that add to the D40x's "fun factor" by providing greater creativity without the need for a computer. Included in the Retouch menu is

Nikon's D-Lighting, which brightens dark pictures, and Red-eye correction, which automatically detects and corrects red-eye—a common occurrence in flash photography. Image Trim allows for creative cropping of an image and creates smaller files for easy e-mailing. Other creative features include Image Overlay, Small Picture, Monochrome (Black-and-white, Sepia, and Cyanotype), and Filter Effects (Skylight, Warm filter, Color balance).

You can even add digital filter effects to your monochrome images. If you're new to the world of traditional filters for black-and-white photography, here's a quick primer. A yellow filter slightly darkens the sky, emphasizing clouds, and is used primarily for landscape photography. When shooting in snow, however, a yellow filter can produce brilliant, dynamic textures. An orange filter produces effects similar to the yellow, but skies are darker and clouds more defined. Although useful for landscapes, orange can also be used for higher contrast in architectural photography. An orange filter can be used in portraiture, especially under warm household light sources to produce smooth skin tones. The red filter produces dramatic landscapes. Skies turn almost black, and contrast is maximized. In portraiture, freckles and blemishes can be eliminated with this filter. A green filter is useful for landscape photography because it lightens vegetation, but doesn't darken the sky as much as the red filter does. Skin tones may also be more pleasing, but freckles and blemishes are more apparent.

This color portrait of aspiring model Emily Blakely was made as a reference to show the effect of using digital filters in-camera for direct monochrome. Exposure was 1/100 of a second at f/6.3 in Shutter Priority mode at ISO 400. © 2005 Joe Farace.

If you select "Monochrome" from most digital SLR menus, this is the result you achieve, but what happens when you add a digital filter? © 2005 Joe Farace.

One filter choice is yellow, probably because that's a general-purpose filter for outdoor photography, but it works well for this portrait of Emily. She's a blonde and the yellow filter makes her a little "blonder." © 2005 Joe Farace.

The orange filter produces a softer look and creates smooth skin tones in portraiture, when photographed under warm household light sources. © 2005 Joe Farace.

Emily's freckles are minimized with the red filter, but it washes out her red lipstick. If you like this look, but want to punch up lip color in black and white with this filter, ***blue*** lipstick is the way to go. © 2005 Joe Farace.

The green filter is usually my favorite filter for portraits because of the pleasing things it does for skin tones, but green also maximizes Emily's freckles (which is not a bad thing). There is no one-size-fits-all approach to which filter works best. The text provides some guidelines, but to get the optimum results, experiment with the kind of pictures that you make. © 2005 Joe Farace.

In-camera monochrome color effects

Monochrome images can be fun, but sometimes you might want to add some color—but not too much! That's when your digital SLR's digital toning modes come in handy. The camera lets you apply one of four different digital toning effects, including sepia, blue, purple, green, and none. Digital filters and toning can even be applied together, and because you get to see the results right away, you can decide if you like the effect or want to make any changes. There is no one-size-fits-all approach to which toning effect works best. It depends on the subject itself, the original colors in the image (if you want to provide hints), and the mood you're trying to achieve. When's the last time you heard the words *mood* and *digital* in the same sentence? But that's what the monochrome filter and toning capabilities of many digital SLRs are all about. Not every photograph should be in color; sometimes a black-and-white or toned monochrome image tells a better story.

Joe photographed his 1953 Packard Clipper club sedan at the Adams County Historical Society outdoor museum in color as a reference for the digital images that follow. Exposure was 1/400 of a second at f/10 at ISO 200. © 2005 Joe Farace.

In Monochrome mode, the same image of the Packard looks like it could have been a newspaper advertisement in the 1950s. © 2005 Joe Farace.

Depending on the subject matter, the blue toning effect would apply a wonderful cyanotype look to an old or pseudo-old portrait. © 2005 Joe Farace.

The biggest surprise Joe had was when looking at the purple-toned image; it was his favorite in the series. The purple tone produces a POP (printing-out paper) "proof" look of the 1940s that is enjoyable to look at. © 2005 Joe Farace.

The green-tone effect may not be the best choice for this particular image, but might be wonderful for some landscape photographs. As in any creative pursuit, make some tests, try different filter and toning combinations, and have some fun. © 2005 Joe Farace.

The sepia-toned example, like the use of digital color filters, does not change the exposure of the image and produces a wonderfully nostalgic effect. This exposure is identical to that of the fill-color image, and is, after all, still an RGB file. © 2005 Joe Farace.

No more film storage

The ability to change White Balance and ISO settings on the go are two of the most important benefits of digital photography for the photo storyteller. Barry and Joe both kept an extra refrigerator at their homes just to hold all the different types of film they were likely to need on any given assignment. If they were not careful, some of the film would go out-of-date waiting to be put to use. Barry recalls several stories justifying this added expense. *Time* magazine assigned him to photograph an on-air radio talk show host. No problem, except that they called Barry after the three-hour program had already begun. He had to drive 30 minutes across town to the radio studio, gain admittance, and be able to produce quality images on color transparency film. This type of assignment was usually lit with his Dyna-Lite portable studio strobes, but their recycle noise would be too loud in a radio studio. Fortunately, Barry had a handful of high-speed, tungsten-balanced film in the fridge. As he raced to the studio, he opened the film boxes and took the film out of their plastic containers, allowing the rolls to warm up more quickly. Assignment completed successfully.

Barry donates his photography services to the annual Columbine High School Run For Remembrance. Race day begins inside under fluorescent lighting, as people register, pick up their race day gear, and pin numbers onto their shirts. This tight close-up of race preparation was taken with the Fluorescent White Balance setting. © 2006 Barry Staver.

A short time later, this race photograph was taken in early-morning light simply by changing the White Balance to the Cloudy setting. © 2006 Barry Staver.

The NFL's Denver Broncos were a client of Barry's for many years. It was necessary to always bring several different ISO films because a beautiful sunny Colorado day can turn to dark, cloudy, and stormy in a heartbeat. At one late-season game, the temperature at kickoff was 60 degrees under bright sun. By halftime, a blizzard had blown into town. The day went from a Kodachrome 64 to a high-speed, tungsten-balanced, pushed-more-than-one-stop Ektachrome day. Barry, of course, had his bags full of film, selling several rolls of the high-speed stuff to one of the *Sports Illustrated* out-of-town staff photographers who wasn't as well prepared. Finally, Barry purchased several bricks (35 mm film packaged in 20-roll bundles) of different ISO films for a *Sports Illustrated*–assigned golf tournament. One day before his departure to the job, the magazine canceled the story, leaving him with hundreds of dollars' worth of film that he eventually used on other jobs. Thankfully, this kind of thing doesn't happen in the digital world. Simply changing the camera settings solves all these problems.

5 Fast lenses

I almost never set out to photograph a landscape, nor do I think of my camera as a means of recording a mountain or an animal unless I absolutely need a "record shot." My first thought is always of light.

—Galen Rowell

Just as with sports cars, computer processing, bullet trains, and Internet connections, being fast is great for camera lenses. It's much easier to take photographs in low light with an f/2.0 or f/2.8 lens than with an f/4.5 or f/5.6 lens. Camera companies don't bury us with choices like the car manufacturers, usually selling just two or three similar lenses in the same focal-length range. We hope that this chapter will make understanding and choosing lenses a bit easier. Some of this "glass" (slang for lens) is very expensive, because it's specialty stuff, absolutely needed by pros in many situations; but as we'll soon see, it's not necessary for everyone.

An understanding of the relationship of shutter speed to lens aperture is necessary to understand the importance of lens speed. Camera shutter speeds are measured in seconds and fractions of seconds. An exposure can be six seconds long

We generally think of fast lenses for action-packed coverage of sports, from loud auto racing to Olympic events. These specialty lenses are just as important, however, for many quiet, serene, everyday events. A fast telephoto zoom lens produced a threefold benefit for this photograph. The women in the prayer circle were not interrupted or disturbed because the 70–200 mm f/2.8 lens allowed the photographer to stay well back out of their "space." The fast f/2.8 lens opening provided shallow depth of field so the hands in foreground are in sharp focus and the arms and hands in the background are out of focus. The wide aperture also allowed the image to be taken with the available light in the room, eliminating the need for a flash that would have totally ruined the moment photographically and spiritually. © 2006 Barry Staver.

or one second. It can also be 1/25 of a second or 1/4000 of a second. This number is the length of time the camera's shutter stays open to make the exposure. It's the amount of time that light passes the shutter curtain and exposes the image onto camera's sensor. The aperture is the size of the diaphragm opening in the lens that controls the amount of light reaching the sensor. A good analogy can be made with water pipes. The aperture is the *diameter* of the pipe, whereas shutter speed determines *how long* a valve is open, allowing water to flow through the pipe.

The amount of light getting through and the amount of time that light is allowed through are equally important to proper exposure. Both must work hand in hand for this proper exposure. The good news is the aperture and shutter speed have a one-to-one relationship. If you adjust the shutter by one full speed, then you must adjust the lens aperture one full stop, and vice versa.

Shutter speeds are usually measured in fractions of seconds, with the standard sequence having an approximate 1 : 2 ratio between each one. The difference between two adjacent shutter speeds on a dial or between aperture values on a lens is often called a *stop* or a *full stop*. Most cameras allow adjustments between these *stops* in one-half or one-third increments. Let's say the correct exposure for a specific shot is 1/1000 second at f/2. In this case, slowing the shutter speed to 1/500 second requires the aperture to be closed down to f/2.8. A shutter change to 1/250 second requires the aperture change to f/4.0, and so on.

Let's suppose your photographic assignment is in a low-light situation. Perhaps it's indoors at a presentation, a school function, a wedding reception, or an athletic event in a gymnasium. Your eye automatically adjusts to the lower illumination and thus your brain perceives the scene as adequately lit. As a photographer, you know how deceiving this can be. Compared to working outdoors

Sir Edward Elgar's ***Pomp and Circumstance*** immediately comes to mind whenever we see the caps and gowns, excited students, and proud parents at graduations. Indoor ceremonies present several problems for photography. One, of course, is the low light in gymnasiums and auditoriums, and another can be the logistics of capturing your graduate when they're handed their shingle. Most schools hire a photography company to photograph each graduate as they cross the stage, making it possible for everyone to have good, clear, well-lit images of their graduate. Why not concentrate on the candid moments surrounding this grand event? Barry used a Canon 70–200 mm f/2.8 IS lens on a 30D body to photograph speakers at this university graduation. The image-stabilization feature on this lens allows for a good solid photograph shot at 1/50 of a second at f/3.2. The loose cropping was intentional to include the school logo on the podium and the banners in the background. The shallow depth of field keeps the speaker in sharp focus while the background banners and the foreground deaf signer are blurred. These add to the "information" in the photograph, telling us it's a graduation ceremony. © 2006 Barry Staver.

in daylight, this type of assignment is in the dark, giving the phrase "difference between night and day" additional credence.

To successfully photograph in these low-light environments, you'll need to make good use of the aperture-to-shutter-speed relationships, and also bring into play the third part of the exposure equation. In the not-so-distant past, these low-light situations were nightmarish for film photographers. Film choices may have been abundant for use outdoors in sunlight, but the choices for dimly lit interiors was quite limited, both for sensitivity to the level of light as well as for the different color temperature of the light. Digital capture, with its ability to increase the sensitivity in low light and correct the Color Balance, makes indoor photography so much easier. In fact, by using fast lenses, these indoor scenes become a "piece of cake."

Once we evaluate the interior lighting—by eyeballing it if we're experienced, by taking a handheld meter reading, or by noting the camera's suggested meter settings (as we point the camera in several directions within the scene)—we can decide how high to set the ISO speed. When it comes to higher ISO quality, digital capture is superior to film but is certainly not perfect. The digital equivalent of high-speed film "grain" is "digital noise." (See Chapter 3.) It's always possible to set the ISO *lower* and choose a long shutter speed to obtain proper exposure. After all, the pioneers in the field did this. Remember them? Their portraits show stiff, stoic, nonmoving folks. If you look close, it's possible to see blur that resulted when people couldn't sit still for the longer exposures. Stopping athletic action, an animated speaker, or even wedding reception dancing just wasn't possible. In low-light situations, you can't rely on shutter speed alone to capture the action of a ball game or the gesturing speaker or the graceful moves on the dance floor. To get acceptable photographs, you must also be

able to "open the lens up" to a wide aperture for success and to use a faster shutter speed to stop the movement.

Zoom vs. prime lenses

Lenses are designed to work under normal lighting conditions. In photographic terms, "normal" means outdoors. Normal lighting may be workable in overcast weather, shade of trees or buildings, or in brightly lit rooms (those with skylights or large and plentiful windows). Basic lenses supplied on point-and-shoot cameras and entry-level SLRs have maximum apertures ranging from f/3.8 to f/4.0, f/4.5, and f/5.6. Some point-and-shoots have only an f/6.3 maximum aperture!

Both varieties of lenses, prime and zoom, are available in either the fast or slower versions for SLRs. There's a growing popularity as well for the *prime* lenses (those having a fixed focal length), due in part to the improvements in reduced digital noise in cameras. Most zoom lenses haven't broken the f/2.8 barrier, whereas many primes are available at f/2.0, f/1.8, f/1.4, and even f/1.2 maximum apertures. Fast, faster, fastest. The combination of these lenses with a clean ISO of 1600 or more means revolutionary opportunities for successful low-light photography—opportunities that didn't exist before.

Matthew Staver photographed these boxers during a trip to Cuba. He and a colleague knew that lighting conditions in Cuban gyms would be primitive in comparison to U.S. standards, so they brought fast lenses along with them (along with proper State Department visas). The extra weight in their backpacks was worth it, however, judging from the images captured. © 2003 Matthew Staver.

Getting up early and leaving the beaten path taken by most tourists can yield exceptional images. In Bagnoregio, Italy, this priest was photographed while riding his bicycle to Sunday mass. © 2002 Matthew Staver.

Zoom lenses for SLRs come in two varieties: fast or slow. Many of the slower zoom lenses have a *floating* maximum f-stop. That means the maximum opening changes within the zoom range of the lens. A 24–105 mm f/3.5–f/5.6 zoom lens is a good example. At the widest focal length of 24 mm, the maximum aperture is the f/3.5. As the lens is zoomed toward the telephoto end, that maximum aperture shifts to the f/5.6 opening. Many popular lengths of zooms feature an f/2.8 max opening: The wide-angle lenses with ranges of 16–35 mm, 17–55 mm fit in here. The 24–70 mm is a workhorse mid-range zoom and the 70–200 mm is its counterpart at the longer zoom range. Expect to see these in the gear bags of most professional photographers. Less expensive, less bulky, and lighter are the f/4.0, f/4.5, and the floating-aperature zooms mentioned before; but these are best left for outdoor, normal lighting work.

These "slower" lenses work fine in the normal outdoor environment. They're great for vacations, mountain and seaside hikes, the amusement park, and general snapshot use. They fall short when the light dips below "normal." Using the water pipe analogy, we have to *open* the valve, letting more water through, or perhaps consider getting a larger-diameter pipe. Once the light levels diminish, we can open up the aperture, increase the shutter speed, increase the ISO setting, or any combination of these. With slower lenses, we run out of apertures quickly, leaving us with only the other two options: As ISO is increased, so, too, is the amount of digital noise in the files. Once these two are maxed out, a shutter-speed increase is all that's left. How well can you handhold the camera for a sharp image? How still can your subjects pose in these low-light conditions?

There's an old rule of thumb for actually determining the best shutter speed to use with a particular focal-length lens to get sharp images. By taking the focal length of the lens as the denominator in the shutter-speed fraction, we have a guideline: a 400 mm lens delivers sharp images when shot at 1/400 of a second; a 50 mm lens at 1/50 of a second; an 85 mm lens at 1/90 (rounding up to the nearest actual shutter speed). These types of comparisons are not exact, but are designed to serve as guidelines for shooting, as well as for determining if it's time to use a tripod. (See Chapter 6.) These guidelines do, however, show us that the ability to capture sharp images goes *down* in lower light because it's not always possible to use a 1/400 second shutter speed at an indoor event.

Take a look at old-time photographs. Ever wonder why they're usually portraits with little or no action involved? That's because the speed of the capture medium of the time—daguerreotypes, tintypes, and glass-plate negatives—was very *slow.* The lens openings were also very *small*, requiring longer exposures.

Many portraits required exposures of several seconds. Portrait studios propped their subjects into straight-backed chairs and even used metal braces hidden behind the subjects to help steady the head. Try this fun experiment: ask your favorite photo subject to sit still for a one-second exposure, a two-second exposure, perhaps even a longer exposure time. It should be fun to see who moves first, causing image blur: the photographer or the subject. The spontaneity of the moment certainly is lost in this kind of situation. Today, we photograph in a different way. We want to capture action, motion. Life moves faster and we must capture it without using braces and straight-backed chairs.

Enter the fast lens. "Fast" is defined at f/2.8 and wider. f/2.0, f/1.8, f/1.4—and yes, even f/1.2. Lenses with these maximum apertures provide the freedom to stop the action and produce beautiful photographs once we've exhausted ISO and shutter-speed limits. This solution to our low-light problems does come with a price tag. Literally. There are many drawbacks to using fast lenses, including purchase price, weight, and size.

If your wallet is able to stand up to the fast-lens challenge, let's move on to the next obstacle: size and weight. Camera manufacturers should include a membership to the local health club with some of these fast lenses, because you need to be in good shape just to carry them around. Canon's 85 mm f/1.2 L lens weighs in at 2.25 pounds, but their 85 mm f/1.8 lens weighs only 14.9 ounces. Although that may seem like an insignificant difference, after a full day hanging around your neck or on your shoulder, your body will notice the difference of the extra pounds. You'll really need the strong arms for the long glass, too. Canon's 400 mm f/2.8 weighs in at a whopping 11.7 pounds, whereas the smaller, lighter f/5.6 is a mere 2.8 pounds. The difference between these two is 9 pounds, which is heavier than the average baby's birth weight. The backbreaking benefit is a full two-stop difference in maximum aperture and is essential for night sports photography. The price is right *if* your livelihood depends on capturing the moment for the client. The same holds true for the weight. It may not seem like much, gaining only one or two f-stops of light with these fast lenses, but that difference will make or break an assignment.

Case study: Canon's 85 mm f/1.2 L lens

For some time, Joe's favorite portrait lens has been Canon's EF 85 mm f/1.8 USM, but now his *new* favorite is the Canon EF 85 mm f/1.2 L II USM. The superb optics of Canon's L-series lenses are designed for the most demanding professional photographic applications—and if you want one, you gotta pay for that lack of compromise that's reflected in its $2000 price tag.

Canon's 85 mm f/1.2 L lens replaces the EF 85 mm f/1.2 L USM and offers the widest aperture of any lens in Canon's EF family, providing a useful combination of focal length, depth-of-field control, and low-light performance.

The EF 85 mm f/1.2 L II USM has an integrated high-speed CPU and uses a ring-type Ultrasonic Motor (USM) for fast and near-silent autofocus, something that wedding photographers will appreciate when capturing quiet moments without attracting undue attention. The USM in the lens focuses (approximately) 1.8x faster than its predecessor. Focus is crisp, and a grippy focusing ring offers seamless manual override, something that's especially useful when shooting wide open, in case you need to shift focus by a millimeter or two. In the world of f/1.2, you can keep a model's eye sharp while blurring the ends of her eyelashes. The shallow depth of field possible at its widest aperture makes this an ideal portrait lens in the studio or on location. Techies will be glad to know that when used in conjunction with Canon's EX flash units, the EF 85 mm f/1.2 L II USM digitally transmits information back to the camera for processing by the new E-TTL II flash algorithm that's found in current-model digital EOS cameras.

Joe's friend and ***Shutterbug*** colleague Peter Burian considers Canon's EF 85 mm f/1.2 L II USM to be a portrait lens, so Joe made a portrait of this hot rod. The 85 mm focal length plus the EOS 30D 1.6x multiplication factor adds a nice perspective and cropping to this photograph. Exposure was 1/250 of a second at f/14 at ISO 320, and was underexposed by –⅓ stop to punch up the colors. © 2006 Joe Farace.

To ensure corner-to-corner sharpness and contrast throughout the focus range, and especially at wide apertures, the EF 85 mm f/1.2 L II USM incorporates a floating-group construction along with a large aspheric-lens element that has variable curvature. It's coated too. An uncoated lens reflects as much as 8 percent of the incidental light, reducing brightness, but the lens coating prevents reflection to suppress flare and ghosting. The 85 mm f/1.2 L II uses optimized lens-element shapes, and has a large circular aperture diaphragm to soften distracting backgrounds. In keeping with Canon's *kyosei* philosophy (living in harmony), the EF 85 mm f/1.2 L II USM features only lead-free glass.

For a more traditional portrait, Joe photographed his wife, Mary, in the bay window of their kitchen, using a Canon EOS 30D. The built-in flash was popped up, but softened with LumiQuest's Soft Screen. Exposure was 1/60 of a second at f/3.5 and was ove-rexposed by ⅓ stop to open the shadows. © 2006 Joe Farace.

After the price, the next thing you'll notice about the 85 mm f/1.2 L II is its size and weight; it's big and it's heavy. At 36.2 ounces, it weighs *twice* as much as the 15-ounce EF 85 mm f/1.8 USM. It can be a handful even when mounted on a comparatively lightweight digital SLR such as Canon's EOS 30D, but attaching the battery grip (BGM-E2) helps balance camera and lens better. The next thing you notice with this lens is the brilliant image in the viewfinder. That image is wonderfully bright on a camera such as the EOS-1D Mark II, and on the 30D's dimmer screen, you couldn't ask for a better view.

Model Dawn Clifford and Joe set out to create a 1950s look for this portrait. Here she's doing her Doris Day impression, which he captured with the 85 mm f/1.2 L II lens at f/3.2 and a shutter speed of 1/60 of a second at ISO 200. The Canon EOS 30D's built-in flash was popped up, but softened by attaching LumiQuest's (www.lumiquest.com) Soft Screen. After looking at the histogram of test shots, he tweaked subsequent images, adding a +1⅓ stop exposure compensation to give a high-key look. Applying Canon's "Nostalgia" Picture Style in-camera gave this image the look of a faded print from the '50s. © 2006 Joe Farace.

The EF 85 mm f/1.2 L II USM is so fast that . . . How fast is it? Shooting outdoors on a sunny day at ISO 100 with a Canon EOS 30D and the lens wide open, the required exposure *exceeded* the camera's maximum shutter speed of 1/8000 of a second. Joe had to stop down to f/1.6 to get proper exposure with the least possible depth of field. On a *cloudy* (really cloudy, not a "cloudy bright") day, he was able to shoot wide open at ISO 100 and get good exposures at 1/1600 of a second, which produced tack-sharp images with a delightfully shallow depth of field. *Bokeh* is an optical buzzword derived from the Japanese word for *fool* (as in, it's not nice to fool Mother Nature), and is used to describe the pleasing quality of an image's out-of-focus areas. A little more subjective than the Richter scale, most photographers know good *bokeh* when they see it, even if they don't know the term. At f/1.2, the 85 mm f/1.2 L II produces a pleasant *bokeh.*

For a while Joe stopped being a fan of Skylight, UV, or even protection filters, but putting a scuff mark on the front of an expensive zoom lens convinced him otherwise. Similarly, you'll want to invest in a high-quality 72 mm Skylight filter (or whatever) to protect the front element of a $2,000 lens like this one. While filter shopping, you might also want to pick up a Neutral Density filter to let you use the lens at its widest aperture on sunny days. A lens hood is also a good idea, but although there's a nice pouch included in the box, the (ES-79II) lens hood is a $50 option.

Even at f/1.6, the EF 85 mm f/1.2 L II USM delivers good ***bokeh.*** This characteristic is generally considered to be a product of the aperture's shape (note the almost perfectly circular out-of-focus highlight) and spherical aberration that's inherently produced by a lens. © 2006 Joe Farace.

To create this faux cyanotype, Joe photographed Lorie using only the window light coming through his home's back door. (The cyanotype was invented by Sir John Herschel in 1842 and was the first successful nonsilver photographic printing process. It's blue, hence the name.) The image was captured directly in monochrome using the Canon EOS 30D's built-in blue toning capabilities. (See Chapter 4.) Exposure was 1/125 of a second at f/2.8 at ISO 320. Camera was in Shutter Priority mode and deliberately underexposed by ⅓ stop to increase shadows and blue saturation. © 2006 Joe Farace.

Let's take a minute to catch our breath and talk about these lenses, their price tags, and our need to have them. Joe has always wondered why professional carpenters are not more like us in their feelings for their tools. Like us, they need expensive equipment to accomplish their work, and cameras and lenses are nothing more than the tools of our trade. Yet although cabinetmakers may covet a new saw, they usually don't rush out and buy one unless they can actually put it to work. That does not seem to be the case with photographers. *We* are more prone to acquire an item for the prestige of owning an interesting piece of hardware. Maybe carpenters would be more like us if they could hang an orbital sander around their necks.

One of the biggest mistakes many of us make when purchasing new equipment is doing so in anticipation of getting an assignment. Does this sound familiar? The phone rings and a client you have been after for a long time is on the line. They have a big job coming up and want to know if you can handle it. "Sure," you say, all the while realizing that you do not have the right equipment to do the best job possible. You ask if you can call back with a price quote. Then you sit down and price the job according to your rate sheet, schedule of costs, and studio policies. Now's the time to see what impact the cost of the new equipment will have. Oh no! Where will *that* money come from? Your bottom line, that's where.

If you can cover the cost of the new equipment and manage to make a profit on the job, you may want to go for it, but only *after* the assignment is guaranteed. The way this scenario usually concludes is that our eager photographer runs out, slaps the new gear on his plastic, and the job is given to someone with a lower bid. If this sounds familiar, you know what happens next. The new hardware ends up sitting in a corner or becoming a very expensive bookend.

It pays to look at alternatives to purchasing new equipment, especially if you have no assignment at all. Have you thought about rentals? Rental photographic equipment tends to not be as clean as your own personal gear and occasionally will fail on the job. That's happened to Joe, but haven't you had your own equipment fall apart while on assignment too? Rentals do offer significant cost savings and you may be able to bill a client for the rental cost. Used equipment is available at a variety of places, mostly online. eBay is the first place that comes to mind and many of the larger camera stores maintain extensive used-equipment departments.

One more time, boys

Indoor arenas—especially high school gyms, classrooms, hotel conference rooms, and ballrooms—are usually dimly lit. Yet

there's a lot of action occurring, and we need to photograph it. The extra stop of light provided by fast lenses is enough to freeze the action, producing acceptable photographs. Another benefit of fast lenses is the shallow depth of field when used at the maximum apertures. After all, it makes no sense to have these specialty pieces of glass if you're stopping down to the mid-range of f/4.5–f/8.0 or f/11.0 on a regular basis. Throwing the background, foreground, or both out of focus is preferable in many photographs, especially for portraiture, sports, and weddings. The eye automatically goes to the *in-focus* part of the image when the rest of the image is soft. The depth of field with these fast lenses, shot wide open, is measured in mere inches or fractions of inches. Although this is a benefit in general, it can cause problems if you're not careful. Let's say you're taking a traditional head-and-shoulders portrait of two people. Even with their heads close together, a photograph made with an f/1.2, f/2.0, or even an f/2.8 aperture could render part of a face out of focus. That's cool in the world of fine art, but not acceptable for traditional portraiture.

Another distinct and often overlooked benefit to using fast lenses: brighter images seen through the viewfinder. Because we're working with these lenses primarily in low-light situations, a brighter image equals less-tired eyes, plus the ability to see the subject better.

A shallow depth of field takes the viewer's eye right to the action of this steer-roping cowgirl. The background is blurred, but with enough detail to set the scene and keep the flavor of the event. © 2004 Barry Staver.

Image-stabilization lenses

Image stabilization is sweeping the camera world, providing another way to achieve success in low-light situations. This technology was originally used by aerial photographers—specifically those working from helicopters—to eliminate vibration from the aircraft. The camera was attached to a cumbersome gyroscope that absorbed the helicopter movement. Canon introduced the technology into lenses in the mid-1990s. A small gyro and computer chip work together—detecting the camera shake, shifting elements to realign the light rays, producing a sharp image. It's possible to take acceptable photographs at a two to four times slower shutter speed than without image stabilization.

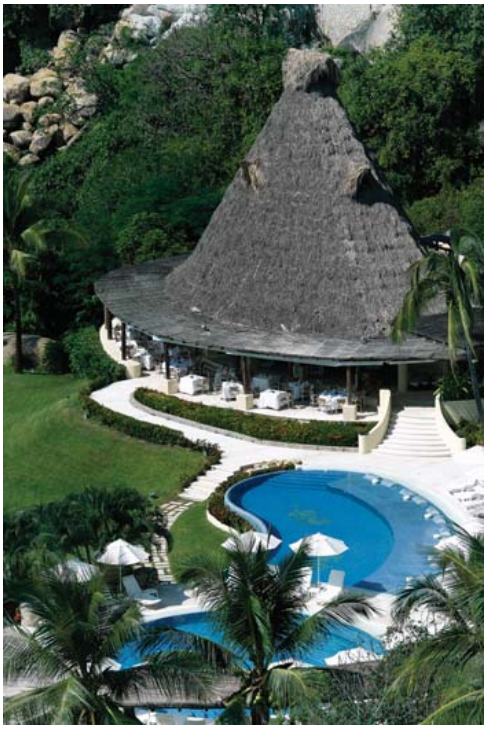
These lenses make our old shutter-speed rule of thumb obsolete. More and more lenses and camera bodies have a stabilizing system built into them, eliminating vibration and motion. The result: sharp photographs in less-than-ideal situations without the need for tripods or other camera supports. It's possible to take sharp photographs at shutter speeds much slower than imaginable. Our rule of thumb tells us that a 200 mm lens should be shot at a minimum of 1/200 of a second. The image stabilization of the lens gave us a three-stop advantage. The IS designation on Canon lenses signifies their image stabilization. Nikon's nomenclature for this kind of technology is VR (for vibration reduction), and they offer a series of VR lenses, including the 24–120 mm f/3.5–f/5.6 G ED-IF AF-S VR and 70–200 mm f/2.8 G AF-S VR. Barry feels that this kind of stabilization feature eliminates the need to use a tripod and provides greater mobility. Joe's not so sure. Most image-stabilization technology *won't work* when the camera and lens are tripod mounted, because there isn't enough movement for the sensors to activate. Canon lenses perform fine when attached to monopods, however, and some feature a setting just for that application.

Case study: fun in Acapulco

Canon's EF 70–200 mm f/4 L IS USM is a lightweight, compact L-series telephoto zoom lens with built-in optical image stabilization. Like all L-series lenses, it's built for pros and sealed against dust and moisture. It uses the latest generation of Canon's Image Stabilizer technology to achieve four shutter-speed steps of camera-shake correction: Three stops in the first 0.5 second of engagement, then another stop after 2.5 seconds. You can also select two different modes: one for more or less stationary subjects, and another for panning.

Joe took the EF 70–200 mm f/4 L IS USM with him on a trip to Acapulco, Mexico and used it as the only lens for two days. It

was again attached to a Canon EOS 5D with BG-E4 battery pack, and formed a well-balanced, easy-handling package. The lens, although light in weight, is no lightweight, and is obviously built to the rugged pro-level standards we've come to expect from L-series lenses.



Quinta Real is a small 94-room hotel nestled into the side of the cliffs on Acapulco's Diamante beach area. This shot demonstrates the versatility of the focal-length range of Canon's EF 70–200 mm f/4L IS USM lens. Exposure was 1/800 sec at f/11 at ISO 200. Focal length was 127 mm. © 2006 Joe Farace.

The EF 70–200 mm f/4 L IS USM lens is the same size as the EF 70–200 mm f/4 L USM lens, but the new lens incorporates a circular diaphragm for more-natural-looking background blur (*bokeh*) and provides distance information for improved AF and exposure with Canon's EX flash units. The lens controls flare and ghosting with coatings and optimal placement of 20 lens elements in 15 groups. One fluorite element and two UD (ultralow dispersion) elements suppress chromatic aberrations for crisp images throughout the focal range. A ring-type Ultrasonic Motor (USM) provides fast and quiet autofocusing, and a full-time manual focus even when the lens is set for AF. Ads that we've seen for this lens show that it comes with only front and rear lens caps, but Canon tells me the ET-74 lens hood is included standard.

The EF 70–200 mm f/4 L IS USM zoom provides two different image-stabilization modes. Mode 1 is for photographing stationary subjects under dim light, but I also found it useful shooting

Taking the EOS 5D and the EF 70–200 mm f/4 L IS USM outdoors to the pool area of the Pierre Marquess hotel, Joe was able to make this shot at 1/800 sec at f/10. He still had the ISO at 320. © 2006 Joe Farace.

from moving vehicles, including cars and boats. Mode 2 corrects for unwanted vertical shake by switching off the lens's horizontal IS function and stabilizes images when panning a moving subject. The downside is that fewer shots with your camera can be made with an IS lens mounted, because the stabilization mechanism consumes more power than does a non-IS lens. That's another reason to turn IS *off* if the camera is mounted on a tripod.

The last VW Beetle rolled off the factory floor in Mexico in July 2003, so it's no surprise you see these rugged little cars everywhere in Acapulco, many of them serving as taxis. Alas, many of them end up looking this like this poor little Bug parked at the Acapulco Yacht Club. Joe liked the way the blue VW complemented the orange wall, and shot this in Program mode with an exposure of 1/160 sec at f/5 at ISO 200. Focal length was set at 121 mm. © 2006 Joe Farace.

Unlike the cryptic symbols used on non-L lenses, which make it impossible to tell when image stabilization is off or on, there's a real on/off IS switch. Yet another control is the focus-limit switch, which reduces near distance so the autofocus doesn't hunt. Choices are 1.2 m (3.93 ft.) and 3 m (9.84 ft.), but Joe admits that he tried both under a wide range of lighting situations and couldn't see any difference in this fast-focusing lens.

The size, speed of use, and yes, image stabilization of the EF 70–200 mm f/4 L IS USM makes it useful for impromptu photojournalism. Joe spotted this union demonstration on Acapulco's main drag while traveling in a car in the other direction. He had a chance to grab only a few shots, but the lens's ease of handling let him make great shots. Exposure in Program mode was 160 sec at f/4 at ISO 320. © 2006 Joe Farace.

Low-light photography is another area where the EF 70–200 mm f/4 L IS USM's image stabilization can come in handy. This room shot in the Pierre Marquess hotel was made at 1/13 of a second, yet is tack sharp at the wide-open aperture of f/4. It was made at ISO 320 with the lens focal length set at 121 mm. © 2006 Joe Farace.

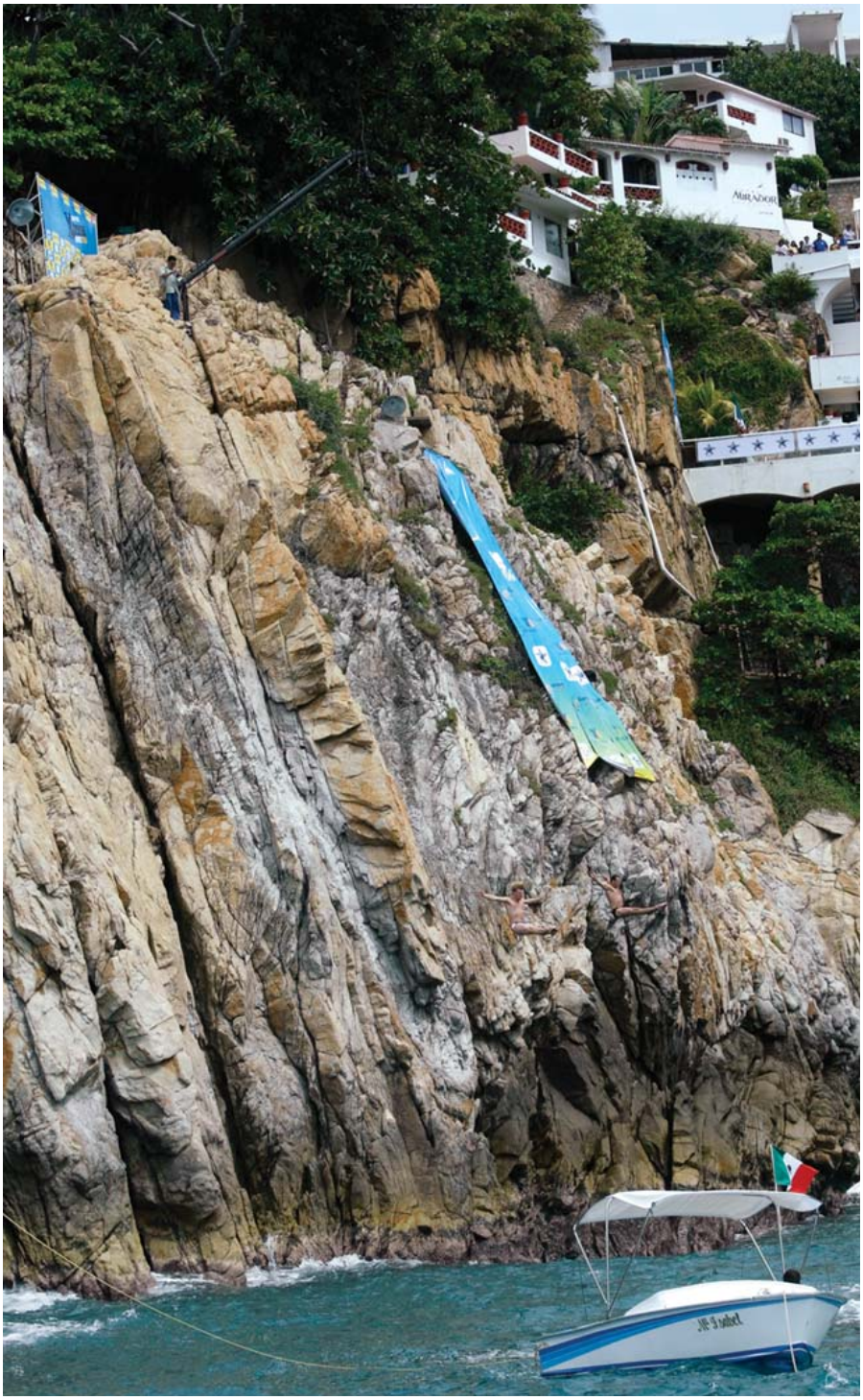
The focal length of the EF 70–200 mm f/4 L IS USM makes it ideal for candid portraits. Its IS function makes it useful for situations where your footing may be less than steady. While on a boat, Joe made a candid portrait of a crewman on an adjacent vessel. Both yachts were bobbing gently in the water, yet the EF 70–200 mm f/4 L's image stabilization enabled him to capture a sharp image. Wedding photographers should be able to make use of this capability in fast-moving situations at receptions.

The focal length of the EF 70–200 mm f/4 L IS USM makes it ideal for candid portraits. This candid portrait was made from the deck of one boat while the crewman was on an adjacent vessel. Exposure was 1/500 sec at f/6.3 with a ⅓ stop exposure compensation to make the white boat sparkle. ISO was 200 and focal length was 191 mm. © 2006 Joe Farace.

The IS function's biggest test came when trying to photograph Acapulco's famous cliff divers from the deck of a yacht being buffeted by heavy waves like a whippet in a whirlpool. Joe had a chance to make only six shots of the divers before a couple of female members of the crew—he thinks it was Mary Ann and Ginger—got violently seasick. The EF70–200 mm f/4 L IS USM never missed a beat and all of the divers' images are tack sharp.

Another place image stabilization helped was while on the Tres Palos lagoon photographing flowers and fauna. The EF 70–200 mm f/4 L IS USM's image stabilization helped him get a crisp photo of a heron who took off just ahead of the boat. Although serious bird photographers will want longer focal lengths, Joe would love to have had Canon's Extender EF 1.4x II with him.

During its extensive workout in Mexico, the EF 70–200 mm f/4 L IS USM never missed a beat and always performed up



Photographing the trials for the cliff-diving world championships from a boat was a challenge to the EF 70–200 mm f/4 L IS USM's image stabilization, but all of the images were sharp, even as the violent swells tossed our little ship (the SS ***Minnow***) around. Depending on how large this photo runs, you may be not able to see just how sharp the divers are, but they are sharp despite the difficult conditions under which the photo was made. Exposure was 1/640 sec at f/13 at ISO 320. © 2006 Joe Farace.

Joe's not a bird photographer, but the EF 70–200 mm f/4 L IS USM, especially with its image stabilization, helped him get this photo of a heron that took off just ahead of his boat while navigating the Tres Palos lagoon. Exposure was 1/640 sec at f/13 at ISO 320. © 2006 Joe Farace.

to—and most of the time beyond—Joe's expectations. As L-series lenses go, this one's a bargain—not only in price, but also in its ability to function under a wide range of difficult photographic conditions. Sometimes the difference between getting a good shot and not getting any shot is a matter of the tools at hand, and the EF 70–200 mm f/4 L IS USM was the right tool at the right time.

In-body stabilization

Olympus, Pentax, and Sony offer in-camera stabilization that works in similar ways. The Shake Reduction (SR) system in the Pentax K100D offers a two-stop advantage for sharp, blur-free images when made under difficult shooting conditions, such as using a long telephoto lens or shooting in low light without a

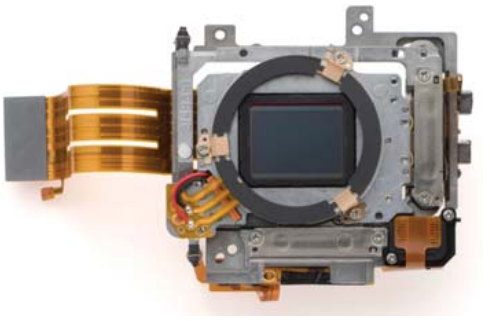
Because the Pentax K100D has Shake Reduction (SR) system built into the body, the camera system does not require special (read expensive) anti-shake lenses and can be used with almost all existing Pentax-mount interchangeable lenses, including those vintage manual focus Takumar lenses you inherited from your granddad.

flash. The SR mechanism is designed to minimize camera shake by using magnetic force to move the CCD image sensor vertically and horizontally at high speed, while adjusting the speed of oscillation in proportion to the amount of shake detected by a sensor built into the camera body.

Like Sony's DSLR-A100 digital SLR, their A700 incorporates Super SteadyShot image stabilization that's built into the camera body and, in addition to Sony lenses, is compatible with many Minolta Maxxum mount lenses. Super SteadyShot image stabilization is a Sony technology adopted from their camcorders and shifts the image sensor to compensate for camera movement. Because Super SteadyShot is built into the camera body, all compatible telephoto, wide-angle, standard and macro lenses are automatically image-stabilized. This allows from 2 to 3–1/2 stops of latitude in exposure and supports hand-held shooting at longer shutter speeds than would otherwise be possible.

Sony's Super SteadyShot image stabilization that's built into the A700s (and other Sony digital SLRs) camera body is based on the same-named feature the company originally developed for their line of camcorders where holding an image steady is maybe even more important than in still image capture.

With the Olympus E-3's built-in mechanical image stabilization, you won't have to worry about blur caused by camera shake that can occur at low light levels or with longer lenses because the body's built-in mechanical image stabilization compensates for camera movement up to five stops. The built-in stabilizer uses Supersonic Wave Drive motors that collect information about camera shake from a gyro that detects and analyzes vibrations and moves the imaging sensor using a piezoelectric element.



The Olympus E3 camera body incorporates a built-in image stabilization system that compensates the effects of camera shake for up to 5 EV steps. The image stabilization utilizes a Supersonic Wave Drive and features two modes: One for movement along both the x and y axes, while another stabilizes only the y axis, which is ideal for sports photography.

Does it matter?

Since there isn't enough movement for the sensors to activate, most image stabilization technology won't work when the camera and lens are tripod mounted. Canon's IS and Nikon's VR lenses perform fine when they're attached to monopods because you can simply turn image stabilization off but some Canon lenses feature a setting especially for monopod applications.

The Forney Museum of Transportation in Denver has a large collection of antique cars, trains, horse-drawn carriages but it's ***dark***. Be sure to bring an image stabilized lens or in this case a Pentax K10D with Anti Shake built into the body and don't be afraid to boost your ISO. Exposure on this classic car was one second at f/11 and ISO 400. ©2007 Joe Farace

Image stabilization almost always eliminates the need to use a tripod and provides greater mobility for your photography but a photograph is either sharp or it's not. Image stabilization, vibration or shake reduction or whatever you want to call it that's built into the lens or the camera body will help you get sharper photographs but it's up to you to do the real work by staying aware that you're working under marginal lighting conditions.

Aficionados and brand-loving Kool-Aid drinkers from both in-body versus in-lens camps will tell you that there's lots of differences between the two kinds of systems and how one is better than the other. Some partisans say the effectiveness of in-body stabilization diminishes as the focal length of the lens increases and that may in fact be theoretically true. But out here in the real world where I make photographs, the differences you'll see on your image files is negligible. In fact, I'd like to make a prediction: In-body image stabilization will also become a de facto standard on future digital SLRs.

What about depth of field?

Shallow depth of field really helps isolate a portion of the photograph. The combination of blurred surroundings and a tack-sharp focal point immediately draws the viewer's eye inward.

Depth of field increases as the lens aperture is closed down: f/4.0 has more areas that are in focus than f/2.8 does; f/5.6 has more in focus than f/4.0 does, and so on. If you want the *least* depth of field possible, it makes sense to work with the fastest lenses you can afford. After all, you can easily stop these lenses down when you do want more in focus.

This tight close-up of woman's face was part of a photo-essay Barry produced as a pro bono assignment for a cancer-awareness fund-raiser. The champagne luncheon and fashion show benefited the Day of Caring organization. The volunteer models had their hair styled and makeup professionally applied before the show. Had Barry opened his 17–55 mm f/2.8 lens to its maximum aperture of 2.8, the near eye would have been completely out of focus. Stopping down to f/4.5 provided a happy medium, with enough detail in the foreground leading to the tack-sharp far eye and makeup brush. © 2005 Barry Staver.

The use of flash equipment is just not possible in many situations, and fast lenses are the only way to get the photograph. Barry routinely photographs for the health-care industry, in surgical suites, emergency rooms, and critical-care units of hospitals. Respect for patients who have consented to be photographed, and medical practitioners as they provide care, is of utmost importance and the firing of flash units would be distracting, and even dangerous in some circumstances. Tripods can also be a hazard in areas where emergency workers are moving about. Finally, to avoid contamination of sterile areas, relatively long lenses are required.

The photograph of the loving hand touching the premature infant's ear is a case in point. Any external light source, either flash or continuous, would disrupt the intensive-care unit and disturb this patient as well as others nearby. Moving in close isn't possible, as a matter of courtesy and safety. A fast lens not only captured the image in very low light, but also helped blur the background. © 2006 Barry Staver.

Some camera bodies have image stabilization built into them, eliminating the need for the technology to be included in each lens. This keeps the price of lenses down and allows every lens made for that camera to in essence be an IS lens by default.

Michael Staver uses the Pentax K100D with image stabilization built into the camera's body. The camera's compact size makes it easy to carry around, yet still obtain good photographs in any situation. This image was taken from a small boat off the island of Oahu on a whale-watching excursion. Despite the boat's rocking motion, this dolphin and water droplets are quite sharp. © 2007 Michael Staver.

Canon, Nikon, and other manufacturers would like all of us to own 300 mm and 400 mm f/2.8 lenses. They would even love to have each of us own a 600 mm f/4 lens. Ayeah, right! The good news is that you do not have to spend all of your beer money on fast lenses. You can get acceptable photographs in low light without f/2.8 and faster lenses. Remember, you can boost the ISO on the camera, use camera supports, and use a few of the following tricks of the trade to succeed.

Make sure all of the lights in the facility where you are working are turned on and turned up all the way. Many light fixtures are controlled by rheostats and not simply by on/off switches. Turn them up. Sometimes these switches are hidden behind drapes or panels, so don't be afraid to ask for a building engineer or lighting technician who can help. Don't be afraid to snoop around a bit yourself. If possible, re-aim and adjust any lights that you

can access in the direction of your subject. For example, track lights can be rotated to point directly at your subject. *A word of caution*: these lights can get very hot. Using a pair of gloves will eliminate painful burns and blisters.

Is there a reflective surface available that can be used to add fill light? Although it's not always possible, placing the subject near white or bright walls is better than having them stand or sit in the center of a room. It never hurts to look around or ask. This trick works only with light-colored walls.

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6 Tripods and other camera supports

People are under the illusion that it's easy. . . . Technically, it is complex. You have a million options with equipment to distract you. I tell my students to simplify their equipment.

—Brett Weston

Tripods come in many sizes, from tiny tabletop models to heavy-duty camera stands for studio use. Because of the availability of so many types, sizes, construction materials, styles, and even colors, there's never a one-size-fits-all solution. Like eating potato chips, you can't have just one. That's why most of us end up with a *collection* of camera supports, with different tripods for different tasks.

A good tripod must not only be steady to allow long exposures like this one, but the support should stay where you place it so that bracketed images can be combined and remain ***in register***. This nighttime photograph of Brighton, Colorado's City Hall was made using Gitzo's Mountaineer Reporter and is a combination of ***two*** exposures. The first (covering everything from right of the large tree on the leading side) was 8 seconds at f/13 at an ISO of 200. The second was made at 2.5 seconds, because the tree and city hall sign were too overexposed. The camera was a Canon EOS-1D Mark II at ISO 200. The two images were combined in Adobe Photoshop CS2 with a simple cut-and-paste operation. The only other tweaking of the image was a little burning of the light streaks created by traffic. Joe did this because the image without the streaks didn't have as much drama. © 2005 Joe Farace.

Standing on three legs

A properly designed tripod provides better image sharpness than would otherwise be possible handheld. Typically, the average person can handhold a camera at a shutter speed that's equal to the *reciprocal* of the focal length of the lens. In other words, you can usually handhold a 135 mm lens at 1/125 of a second and get sharp photographs. When in doubt, many photographers increase the shutter speed. Did you know that when using cameras with focal-plane shutters, the typical shutter type used for SLR cameras, the effective speed of the curtains at 1/1000 of a second is the *same* as at 1/30 of a second? At higher shutter speeds, the only thing changing is a narrowing of the space between the two curtains.

Image-stabilization and vibration-reduction lenses (See Chapter 5) can produce sharper images, but even the most high-tech lens can't be a three-legged assistant. You can leave your camera perched on a tripod, walk up to a portrait subject to touch up a

If a picture is worth a thousand words, this one says it all about digital photography. Predawn light brightens the horizon as a photographer prepares to photograph the sunrise. He's able to check the scene from the LCD screen on the back of the tripod-mounted camera. © 2003 Barry Staver.

The Tiltall tripod uses a timeless classic design and has been manufactured almost continuously since 1947. This colorful prototype was made for Joe as a potential new model, but it never entered production. The physical design of this Tiltall is the same as was originally produced by Caesar and Mark Marchioni, and is the same as the tripods you can purchase today from major retailers such as Adorama (www.adorama.com) and B&H Photo (www.bhphotovideo.com.). © 2006 Mary Farace.

pose, or pick up a twig, and it will be waiting when you get back. Using a tripod also enforces a more deliberate approach to making photographs. Having to *think* about composition before banging off a few frames will improve the quality of your images more than you might imagine. A tripod is also the sign of a serious photographer and produces respect from nonphotographers. For whatever reason, people seem to extend more respect and move out of the way when they see a photographer with a tripod.

Some applications *demand* a tripod. For close-up work, a tripod is a necessity. The use of small apertures for macro work must be compensated for with slower shutter speeds. At the other end of the spectrum, long-focal-length lenses for sports or wildlife photography require a tripod—sometimes two. Depending on the focal length, you may need tripods for the camera body *and* the lens.

Mooning the camera. This total lunar eclipse was the second in just one year and Barry was fortunate enough to photograph both. He turned this personal project into a relaxing backyard evening event. First, his Gitzo tripod was set up in the middle of the yard with a 400 mm f/2.8 lens with a 1.4X teleconverter attached. Two lawn chairs were set up: a laptop placed on one to download and check the first test shots, and one to sit on (these eclipses take a couple of hours start to finish). Next, he reheated several slices of pizza, popped the top on an ice-cold beer, and waited for the eclipse to begin. The tripod was an absolute necessity to hold the telephoto lens/teleconverter combination steady, especially during this dark portion of the eclipse.

There are just a few basics needed for a good tripod. It must be sturdy, but lightweight enough so that you'll use it! After that, it becomes a matter of matching the tripod to your way of working. When Joe realized he could hold a camera steadier than his first tripod could, he threw out the tripod. The head wore out because he ignored the first question you should ask yourself: What kind of camera am I going to use with this tripod? He'd been using a medium-format camera on a tripod that would have given him better service with a 35 mm SLR. The weight of the camera was too much for the head and it wore out. The kind of camera you use affects the type of tripod that's right for you.

When capturing infrared images with an IR-sensitive digital SLR, the "filter factors" of the filters require ***long*** exposures. This image was made with a Pentax K100D with a Singh-Ray I-Ray filter in front of the lens and had an exposure of 0.7 second at f/9.5 and ISO 800. No matter how good you think you are, you can't handhold speeds that slow, which is why Joe used a Manfrotto (www.bogenimaging.com) tripod to make this shot. © 2006 Joe Farace.

Stand by My Side

Although they are not portable enough for typical location photography, we want to show you that camera stands are available in many styles, shapes, and sizes—and are dedicated to ***studio photography only***. Camera stands provide the ultimate in stability, security, and precision. Because of its size and weight, a camera stand is inherently more stable than are three tripod legs. Camera stands provide a large, heavy base and a large, thick center column with an arm riding up and down and where you can attach a head and other accessories. A camera weight stand provides security for your expensive gear. When using a stand, the chances of your medium- or large-format camera falling over and crashing into the studio floor are negligible. Precision is also an important part of using a camera stand. Most of them glide across the studio floor on ball bearings before being locked down with a foot pedal. The crossbar arm, often labeled in micrometer-like markings for precise camera placement and movement, is important when doing still-life and product photography. The crossbar is, more often than not, gear driven, providing flexibility for lowering the camera to within inches of the floor.

Flexibility is provided by a choice of camera heads and the ability to add accessory trays for laptop computers for image display during digital capture. Camera stands cost more, too, but make you more productive in the studio. You can pay up to $5,000 for a camera stand without any accessories, but ***every*** photographer I know who's switched from tripods told me they don't know how they ever survived ***without*** their camera stand.

It's made of *what*?

On one side of the tripod debate is the "bigger is better" group, who want an earthquake-proof tripod that's also steady in a tsunami. On the other hand, there's the "lighter is better" group, who believe that it doesn't make a difference what a tripod is made of, but that a *lighter* one is more likely to be taken along.

Most tripods are made of metal, with all kinds of alloys being popular, including aluminum and titanium. Some Slik (www.thkphoto.com) tripods have A.M.T. super titanium-alloy legs, a material that has a 40 percent greater strength-to-weight ratio than aluminum does. Carbon fiber is the hot new tripod material, and is the same high-tech substance used in Formula One racing cars to save weight. When used in tripod construction, carbon fiber has many advantages over metal, starting with its extremely light weight and high strength. Carbon fiber is *eight times* stronger than steel, yet is four times lighter—characteristics that have endeared it to race-car and tripod designers alike. In addition, carbon fiber is noted for its ability to absorb vibrations, and has a thermal and expansion transfer rate that's significantly less than that of most metals.

Many photographers assume that aluminum tripods are lighter than wooden ones, but an aluminum tripod with support qualities equal to a wooden tripod actually weighs *more*. It takes heavier metal legs to match the stability and durability provided by the interwoven grain of lightweight wood. When working in extreme temperature conditions, wooden tripods, such as those produced by Ries (www.riestripod.com), who even makes a monopod, can be indispensable. Wooden tripods don't absorb heat *or* cold, so fingers won't stick or get burned as they might with metal.

Slik's A.M.T. (Aluminum-Magnesium-Titanium)–alloy legs make the PRO 780 DX tripod heavy duty and steady, yet it's lighter than it looks. The PRO 780 DX is capable of supporting the weight of professional digital cameras and heavy telephoto lenses up to a 400 mm f/2.8. This complete tripod offers professional photographers and advanced amateurs the strength and stability they need, and its size and the use of A.M.T. alloy make it light and portable.

Berlebach German ash wood tripods (www.berlebach.de) are known for their low vibration and solid support. Ash compensates for the vibrations and is nonconductive, preventing the damaging effects of electromagnetic fields and electrostatic charges. In arctic conditions, you can handle a wooden tripod without having to wear gloves. Then there's the aesthetics factor: Some photographers feel that no other material has the warmth and allure of wood.

Carbon-fiber choices

Gitzo's (www.bogenimaging.com) Carbon 6X tripods reduce overall weight by up to 17 percent and use a six-crossed multilayer tube that's 30 percent lighter *without* sacrificing strength and stability. Part of lightening Gitzo's 6X tripod legs involves making the standard 1.5 mm carbon-fiber tube *thinner*. By using a six-layer construction, the tubes are 1 mm thick, but are "equally as strong and as stable" as Gitzo's 1.5 mm three-layer carbon-fiber tubes. Their Mountaineer 6X tripods are constructed using a screw thread and adhesive dual-jointing technology called Hybrid Interconnecting System (HIS) for increased ruggedness and durability.

These tripods add an Anti Leg Rotation (ALR) system that allows for fast and smooth setup unlike any other Gitzo tripod Joe has ever used. Gone are the days of fighting to unlock the legs and get them extended. This new system lets you loosen all

Carbon 6X tripods utilize an Anti Leg Rotation (ALR) system that allows them be set up in less than 15 seconds by loosening all the twist locks on each leg at the same time, then pulling the leg down and tightening the twists individually. All Mountaineer 6X tripods are also fitted with an antirotation grooved center column for increased stability.

twist locks at the same time and pull down the leg before tightening them. Bogen Imaging claims a setup time of 15 seconds for a five-section model. The legs are tipped with removable rubber feet that are interchangeable with Gitzo's universal accessories such as the "big foot" series or spikes. The tripod's top castings are corrosion resistant, with polished stainless casting bolts for stability. A built-in, spring-loaded retractable hook on the bottom of the center column provides a place to hang a counterweight, and won't get caught while carrying or packing like the fixed hooks on other tripods.

A well-made carbon-fiber tripod is a lot like a Ferrari Enzo. Both products are made of carbon fiber, people *really* want to own one, but most times they simply can't afford it. Flashpoint's family of tripods and a monopod are priced so the average photographer can afford one.

Both the Ferrari Enzo's body and Flashpoint tripod's legs are made of carbon fiber. Most people can't afford to buy an Enzo, but most people ***can*** afford a Flashpoint carbon-fiber tripod. © 2003 Joe Farace.

Along with an affordable price tag, Adorama's three affordable Flashpoint carbon-fiber tripods feature classic European styling. Few, if any, carbon-fiber tripods are completely manufactured from this expensive man-made material, and the Flashpoint family is no exception. The top, leg brackets, and fittings are made from lightweight and tough magnesium alloy. Every Flashpoint tripod comes with a wrench for tightening and adjusting the legs, so friction is set just the way an individual photographer prefers.

The Flashpoint tripod family consists of three models that are shown here with their optional ball heads. These are all early production models and Adorama told us that some slight cosmetic changes are to be expected with the final product. What won't change is the rugged carbon-fiber construction and low price. © 2007 Joe Farace.

The Flashpoint tripod line includes the three-section model 1128, which measures 21 inches long when the legs are compressed, making it useful for the landscape and nature photographer who wants something small and light to attach to their camera bag or backpack. Fully extended (*without* the optional head), the 1128 measures 48 inches long, but weighs only 2.64 pounds. The main leg of the three-section Flashpoint 1228 model has a wider diameter than the 1128. At 22 inches long, it's also a little longer than the 1128 and extends (again without the head) to 52 inches. It weighs just 3.30 pounds. The main leg section of the 1328 model has a 1-inch-diameter tube. It uses a four-section design, allowing it to compress to 20 inches and

extend to 57 inches. All Flashpoint tripods have adjustable center sections that add 10 inches to the maximum camera height, and feature a hook at the bottom for hanging a shot bag for extra stability on windy days.

All Flashpoint carbon-fiber tripods have a top plate that features a level bubble for precise setup or when shooting panoramas. The angle of each leg is adjustable to suit a variety of photographic conditions. All you need to do is push a leg in, slide out a metal tab, and the leg will move past its stop and be placed at any possible angle for low-level and macro photographs. The tips of each can be set up with either a rubber tip for working indoors or a spike when working outdoors.

How steady can a lightweight tripod be? This photograph was made with a Pentax K10D mounted on a Flashpoint F-1328 tripod with a KK-3 ball head. Exposure was ***five seconds*** at f/11. No Star filter was used; you'll get those kinds effects when using small apertures and long exposures. © 2007 Joe Farace.

Legs and feet

Tripods have three legs and the legs themselves come in different numbers of *sections*. A tripod with three or fewer sections is typically stronger, steadier, and less expensive than one with *more* sections. When backpacking, tripods with four or more sections may appeal to you, but although they are compact, they may not be as rigid.

There are many kinds of tripod legs. The tubular style is strongest because a metal wall completely surrounds the leg. The open side of the channel leg often used in inexpensive tripods can be attractive, but this type of leg is weaker and easily twisted. Some professional tripods use square legs closed on all sides for strength, but retain the aesthetics of the channel leg. The size of the leg has an effect on stability. The larger the diameter, the stronger the leg, but crutch-style legs provide extra stability without extra weight, and have always been popular for pro video tripods.

Round legs generally have threaded collets that can always be tightened enough to lock the legs in place. Tripods with channel legs typically have locking levers. These levers are easy to use, but can wear out faster. Manfrotto's legs use rapid-action lever leg locks that easily snap open or lock, which can be especially handy when working outdoors in cold weather, when collets can be sticky and difficult to open with gloved hands.

Joe has a love/hate relationship with tripod leg locks. On one hand, he likes the precision of flip locks à la Manfrotto; on the other hand, he likes the traditional twist locks that Gitzo, Flashpoint, and others use. All Flashpoint carbon-fiber tripods have rubber double-grip twist locks that allow the legs to be tightened whatever the outside temperature may be. Even under frigid, wintry Colorado conditions, Joe has never had a problem locking or unlocking any of the legs. He attributes that fact to the thermal properties of the carbon-fiber legs around which the locks are wrapped.

Some tripods feature leg braces that extend from the center column to each leg. This type of construction prevents the legs from closing when you don't want them to. Braces make the tripod heavier and more difficult to fold quickly, but they add to overall rigidity, although this additional rigidity may not be necessary if the leg diameter is large enough.

There are as many different kinds of tripod feet as there are sneakers for *your* feet at the local Foot Locker store. The most basic foot is the crutch tip, a rubber cup that prevents metal legs from scratching the floor. Some tripods feature rubber tips for wooden and other slippery surfaces, plus a retractable spike for outdoor use.

Heads and columns

Some manufacturers offer a choice of leg and head types, allowing you mix and match. You may even want to use one manufacturer's head on another company's legs. There are basically two different types of tripod heads—ball or pan—with variations in between. Ball-head aficionados tell you their favorite is quick, easy to use, and you don't have to turn different levers to move it where you want. Pan-head folks say it's easier to level the camera or follow movement. Try both and pick the one *you* like. Camera stores tell us that they sell an even number of ball versus pan heads. Make sure the head is appropriate for the camera. The larger the platform, the more securely the camera can be seated and balanced. A larger head also provides space for positive-locking mechanisms.

For years, Joe was a big fan of the traditional pan/tilt heads because he felt that this design provided more precision when

composing a shot. Others—including his wife, Mary—preferred ball heads because they were easy to use, fast to set up, and didn't take up a lot of space with gawky handles and levers. The downside of ball heads is that these precision devices were usually more expensive, and sometimes you needed to purchase an optional QR (quick-release) shoe/plate to attach your camera to the head.

Manfrotto's 804RC2 head uses a new high-performance polymer, known as Adapto, that's comparable to aluminum in strength, but is 50 percent lighter. The low profile of the 804RC2 features a spirit level and a fixed counterbalance spring on the tilt motion to help support varying equipment loads of up to 8.8 pounds. The fixed counterbalance spring helps prevent a front-heavy camera from crashing forward when released. The spring also makes it easier to tilt the camera to the right position without struggling with that extra weight.

Although you can attach any tripod head to these carbon-fiber tripods, the optional Flashpoint ball heads, such as the KK-3 shown mounted on the model 1328, are an ideal complement. These ball heads are exceptionally well made and the prices are a bargain. The Flashpoint tripod center section uses a collet-style locking/unlocking mechanism for raising and fixing the center section. What you ***can't*** see is the hook at the bottom to attach a shot bag for extra stability. © 2007 Joe Farace.

Ball heads are compact and feature a knob or lever that locks and unlocks the ball mounted under the camera platform. By unlocking the ball, you can move the camera freely in any direction. A variation is Bogen's Grip Action ball head, which uses a pistol-grip style that lets you position your camera anywhere within a 180-degree sphere. A pan head usually has two or three levers to control forward and backward motion, plus the ability to change from horizontal to vertical. Two-lever models make you reorient the camera for vertical or horizontal photographs, but some provide flexibility by using a small lever for this flipping action. Each movement of a pan head requires locking that movement. Unlike a ball head, one axis can be adjusted at a time. This can be especially important when doing architectural photography.

Flashpoint's magnesium-alloy ball heads feature a micrometer-marked base with rubber-gripped adjustment knobs and a quick-release shoe for attaching your camera. Controls include a pan lock knob for holding the head in a horizontal position and *two* friction-adjusting knobs. The larger one will lock the head in place at any angle. The smaller knob provides for fine adjustments without having to completely loosen the ball and reframe your composition all over again. There's a fourth control at the top on the QR base for locking the plate and in turn locking the camera in place.

For photographers who need to change cameras quickly, a quick release is an important accessory that's built into some heads, and allows the camera to be removed without unscrewing it. This is usually accomplished by screwing into the camera's base a *foot* that slips into a *shoe* in the head—although Hasselblad builds a foot into their cameras, making a QR attachment a must for users of these cameras. Just as important is camera *placement*, which can be assisted with accessories such as Adorama's Macro Focusing Rail Set. This precision device provides for fine-focusing adjustment and has two rails for allowing movement in *four* directions. Novoflex (www.hpmarketingcorp.com) also offers a series of precision focusing racks for use on tripods or copy stands.

Adorama's Macro Focusing Rail Set is specifically designed for tripod-mounted macro photography and has a smooth rack-and-pinion movement that provides extremely fine focusing adjustments. The Macro Focusing Rail Set has two 6-inch rails that allow precise movement in four directions and has positive-locking knobs to assure rock-steady focus.

The most common type of center column is the lift type, which uses the photographer's arms to raise and lower it. Locking is provided by a screw lock or collet. With a geared center column, a crank is used to raise or lower the column. This provides precision in raising or lowering the column but is slower than the lift type. Check to see if the gear teeth are sturdy enough for your camera. Some professional tripods use a clutch system, which provides a combination of lift and crank types. The center column is unlocked by depressing a spring lever that's automatically locked when the lever is released. Some kind of friction control is also important. If you've ever had a camera come crashing down, you know what we mean. The tripod should have some type of control that adjusts to the weight of the camera so the camera remains balanced even when unlocked.

The tripod bottom line

A good tripod protects the investment you've made in expensive optics by delivering the best possible photographs. Good tripods

This abandoned church in the ghost town of Dorothy, Alberta, Canada was photographed by Larrie Thomson during a long tripod-mounted exposure illuminated mostly by moonlight. Larrie says, "It is possible to walk through the frame while the film is exposing, provided you don't stay in one place for too long. This makes it possible to enter and exit buildings to add lighting from ***within***." He captured this image by the light of the full moon, with interior lighting added using a flashlight and amber gel with an exposure of eight minutes at f/5.6. For this specific shot, he exposed Kodak EPT 160 ISO tungsten slide film, but you could achieve the same effect using an ISO setting of 160 and a Tungsten or Indoor Color Balance. (See Chapter 4.) © Larrie Thomson, www.nightphotographer.com.

aren't cheap, but that doesn't mean there aren't some bargains. Because 90 percent of sales of top-of-the-line tripods are to photographers unsatisfied with their old tripod, check the tripod's construction. Does it lend itself to simple and inexpensive repairs? All of these factors add up to a tripod that will give years of service and improve your photography at the same time. And that's not a bad combination.

Monopods

Sometimes you encounter situations when you can't carry a tripod, or there's just not enough space to use one. That's where a *monopod* really comes in handy. If you're shooting sports, a monopod is especially useful when working with long lenses in the tight spaces to which sport shooters are often assigned. If you're photographing from the stands, a tripod can interfere with the spectators, but a monopod won't. For nature photographers and backpackers, where space and weight are at a premium, monopods are an ideal solution. But let's face it, a monopod is just a *stick*. It's a stick that has to hold your camera securely, for sure, but still a stick.

Monostat of Switzerland's (www.monostat.us) RS16 Professional monopod takes a slightly different approach, but starts with the basics. The RS16 has a three-section design with the ubiquitous twist locks and weighs 1.3 pounds. It's made of lightweight but strong aluminum, extends to a maximum height of 61.8 inches, yet can be compressed to 2 feet and attached to your camera bag or backpack. What sets this monopod apart from the rest is its *foot*. Unlike typical monopods that have a rubber or spiked foot, all Monistat monopods use a flexible Rotation Stabilizer (a.k.a. foot). This design is stable along vertical and hori-

Another example of a monopod's usefulness: Have you ever tried following a butterfly around on its busy schedule in a field of pokey weeds? Imagine adding a tripod to the equation! This delicate creature stayed on the weed long enough to be photographed with a 300 mm f/4 lens coupled to a 1.4X teleconverter. © 2005 Barry Staver.

A monopod is a ***necessity*** when working with a large, heavy lens such as Canon's EF 500 f/4. A tripod is just not practical in such fast-moving situations. This race car was photographed at Laguna Seca Raceway with an exposure of 1/320 sec at f/10 and ISO 800. The picture is so sharp you can see the driver's eyes clearly through his helmet visor. © 2004 Joe Farace.

Flashpoint's carbon-fiber monopod is 19 inches long when closed and extends to 58 inches. Its 10-ounce weight makes it a good choice for sports and nature photographers who work with long-focal-length lenses and don't always have enough space or time to set up a tripod. The three-section Flashpoint monopod has a 1-inch diameter main tube and a foam grip over the main portion. The top of the monopod (and all the Flashpoint tripods too) has a reversible attachment for mounting a camera or tripod head.

zontal axes, and is grippy on normally slippery surfaces including tile—and even on ice, which we have a lot of in Colorado.

Whereas Joe prefers the three-section Professional model, some pros might prefer other configurations in terms of length and number of sections. The RS16K All-Round is a four-section monopod that extends to 61 inches, but can be retracted to 19 inches. It weighs 1.3 pounds and is available in matte aluminum

The foot of Monostat of Switzerland's RS16 Professional pliable design has more in common with a snowshoe than with a suction cup and is safe for use on those polished and expensive wooden floors—even ice! © 2007 Mary Farace.

or black. The RS16SK Compact is a five-section monopod that measures 16.5 inches, but extends to 57 inches. Taller shooters will prefer the RS16SL X-Long, which is 21.25 inches long, but extends to 75.5 inches.

Monopods can be used with the same type of heads as a tripod, but are typically used *without* any head, and are easily tilted to get the perfect angle that the ball-head-style RS foot accommodates nicely. All Monostat-RS monopods have a reversible $^{3}/_{8}$-inch and $^{1}/_{4}$-inch mount that can be screwed into your camera's base or the tripod collar found on long-focal-length and zoom lenses. The monopods come with a surprisingly nice,

Monostat has chosen to use the old-school twist-lock legs because, they say, twist locks can always be tightened whatever the temperature. Joe would have preferred a softer, grippier rubber on the twist locks rather than Monostat's wide-tread design, but he can see that their wider grooves are less likely to get filled with snow or mud when the going gets sloppy. You should be using gloves in these situations anyway, so maybe it won't matter much.

lined carrying case and have a two-year warranty. Like all monopods, they're still just sticks, but these precision, Swiss-made monopods with their unique foot design *are* something special.

The Pod

Tripods are useful but take space. On the other hand, the beanbag-like Pod (www.bogenimaging.com) easily fits inside a jacket pocket or camera bag when you're hiking. The Pod is available in three different colors and sizes. I've been using the Red Pod, which weighs 0.75 pound, measures 5 inches in diameter, and is 2 inches thick. The smaller Yellow and Blue Pods weigh 0.4 pound, measure 3.75 inches in diameter, and are 1.75 inches in width. The Blue Pod is designed for cameras or camcorders with off-center tripod mounts.

The Pod uses the standard ¼-inch camera-mounting screw and is covered with water-resistant, industrial-grade nylon. It has a nonmarking, nonslip base, and won't scratch or mar surfaces.

Joe photographed his hotel in Laughlin, Nevada at night. The hotel sits on the river, but the river is visible only on the other side, so he created his own river using Flaming Pear Software's Flood Photoshop–compatible plug-in (www.flamingpear.com). Not only did it add "water," but the effect also hid all the cars in the parking lot. The image was captured with a Leica D-Lux 2 that was supported by a red Pod placed on top of a trash can in the parking lot. Exposure was 1/10 of a second at f/3.2 at ISO 400. © 2006 Joe Farace.

Panorama heads

One of the best ways to shoot panoramic images is with a panorama head. Novoflex has long made a series of what they call panorama plates, and the rest of us call panorama heads, although they really are closer to being a *plate* than a *head*. Like all support-related products, the Novoflex Panorama = Q and Panorama = Q Pro are media passive, not digital specific, so you can use either one with a film camera or a digital SLR.

Here are four of the five images used to create the five-shot panorama of the exotic-car showroom. As you can see here, frames should overlap by one-third or one-fourth, but you should always check as you pan to the next increment to make sure you have sufficient frame overlapping between shots.

The freely rotating Panorama = Q has two 180-degree scales with 10-degree markings and an integrated spirit level to help maintain exact horizontal adjustment of the camera. A handy knob lets you accurately lock the camera into any desired position. The integrated quick release is part of Novoflex's Q = Mount System, and takes some getting used to, but is surprisingly effective.

The Panorama = Q PRO name reveals the professional orientation of this panorama plate. A blue adjustment knob enables you to choose from eight different click-stops and the numbers on the knob are the number of detents in a full circle. If you do not want *any* detents, turn the knob counterclockwise to 36 and use the smaller gray knob along with the 360-degree scale to lock down the camera, in effect turning the Pro unit into a larger version of the free-rotating Panorama = Q. Otherwise you can choose between the following adjustments: 6x click-stops in 60-degree steps, 8 stops in 45-degree steps, 10 stops in 36-degree steps, 12 stops in 30-degree steps, 15 stops in 24-degree steps, 18 stops in 20-degree steps, 24 stops in 15-degree steps, or 36 stops in 10-degree steps. Keep in mind that the *number* of steps is based on what it takes to produce a 360-degree series, not just the three to five shots that most panorama photographers want, but it's there if you need it.

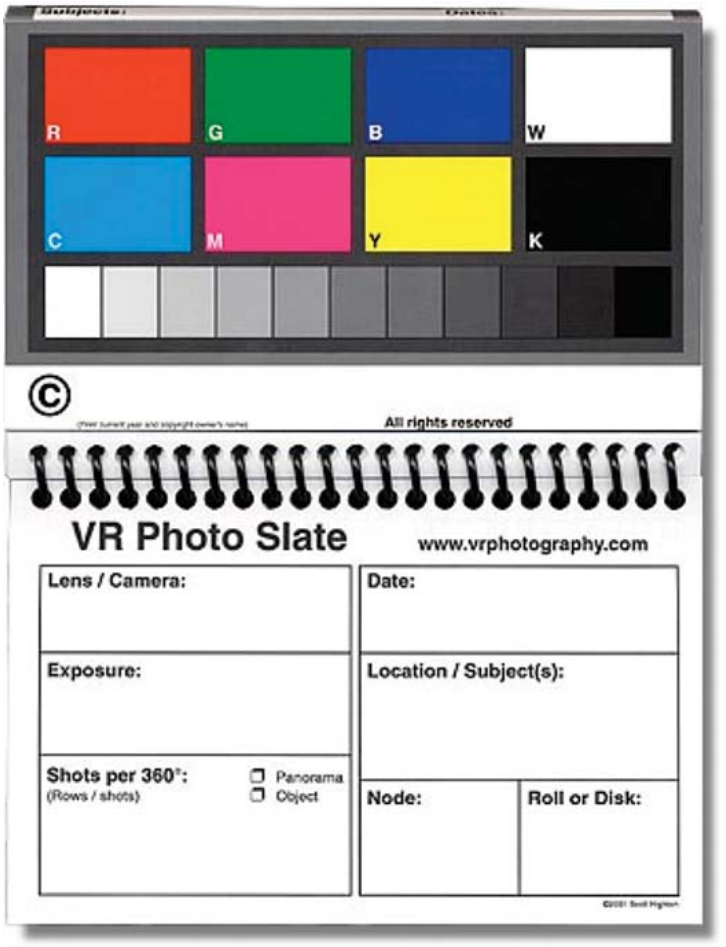
A special cross spirit level guarantees accurate adjustment of the camera and using it to level the camera is the first step in creating a panorama. Both panorama plates are compatible with most tripod heads. Joe prefers using it with the Tiltall's flat mounting surface and using its two adjustment handles to make leveling a snap.

The Panorama = Q PRO also uses Novoflex's Q = Mount System. Loosen the knob opposite the blue "panorama" knob and slide off the camera attachment. Next, you'll need a screwdriver to attach the Q = mount to the base of your camera, but in the field, a Swiss Army knife will work perfectly for the job. Slide the mounted camera back on, tighten the blue knob, and it's secure. It lacks an arrow showing which way the lens should face, as in Manfrotto's QR system, and that's important so your camera doesn't cover the level. If you make sure you can read the Novoflex name on the mounting from camera position, you'll be O.K. If it covers the levels, turn the camera 180 degrees. This may not be as fast to quick mount as some others, but there's no doubt that once attached, the camera's not going anywhere.

Shooting an indoor panorama has its own set of challenges. Let's take exposure. You have to shoot in Manual mode because any of the camera's Auto modes will try to optimize an individual frame, and when the images are combined using Photoshop's Photomerge (File > Automate > Photomerge), they won't match. The same is true for Color Balance. Auto White Balance normally works great, but having five shots, each perfectly color balanced, won't work in most indoor settings. Then there is the question of how many segments to shoot.

The $18.95 Virtual Reality Photography Slate Book (www.vrphotography.com) is indispensable for this kind of photography. It measures 4 × 6 inches, so you can keep it in your pocket. A VR Photo Slate page and the fold-over cover color target can be photographed as the first frame of your sequence under the same lighting conditions of your subject. The color target will give you a reference for color corrections in postproduction and the slate information provides a reference for stitching and any other assembly information. The book includes focal-length/field-of-view chart, hyperfocal-distances chart, and a grayscale/rectilinear-correction chart.

The angle-of-view chart is based on a full-frame SLR. If your digital camera has a smaller sensor, just apply the camera manufacturer's multiplication factor to the focal length of the lens



The Virtual Reality Photography Slate Book (www.vrphotography.com) is indispensable for panoramic or VR photography. It measures 4 × 6 inches, so you can keep it in your pocket.

you're using. If you're using a 24 mm lens and have a 1.5X magnification factor, you multiply the 24 mm by 1.5 to get a 35 mm equivalent and look up 35 mm on the chart. Because Joe was shooting with an EOS 5D, the angle of view on the chart told him how many shots were needed for a 360-degree circle, including the required overlap. You turn the Panorama = Q PRO's blue knob to select how many increments you want to shoot, but because this number is for a 360-degree set, you may want to shoot less.

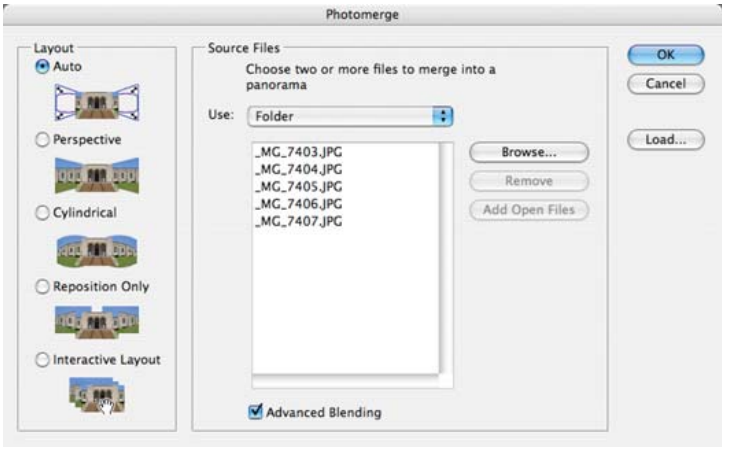
One rule about overlap is that frames should overlap by one-quarter or one-third and that's what the chart's recommendations seemed to produce. Joe made some tests and actually shot at settings more or less than what was suggested. Always visually check your calculations when shooting. Look through the viewfinder or the LCD preview screen (a preference if you have a big screen) as you pan to the next increment, making sure you have one-quarter to one-third of the frame overlapping

between shots. *Tip*: Make sure the Panorama = Q PRO is tightly mounted on your tripod head. If it is not, the plate can shift when you move it from one click-stop to another, ruining the sequence and requiring that you start all over. Initially, the plate was stiff when moving from detent to detent, but it seemed to warm up after being inside a cold car trunk and the motion between indents became silky smooth.

This is a five-shot panorama made with the EOS 5D in Fluorescent White Balance mode that produced clean color in a mostly fluorescent environment. Exposure was 1/8 sec at f/9 at ISO 6540. Lens was Canon's EF 22–55 mm f/4.0–f/5.6 zoom at 29 mm. © 2006 Joe Farace.

Postproduction

There are more different kinds of panorama software available than there are panorama heads, but for the images made with the Novoflex plate, Joe used Adobe Photoshop's Photomerge function. This uses the program's Auto Align Layers function to make quick work of assembling the panorama. PhotoMerge's dialog box offers five different ways to align images: Auto, Perspective, Cylindrical, Reposition-only, and Interactive Layout. You can select a folder of images, and even though the images were shot right to left instead of left to right, Photomerge assembled them left to right and lined them up perfectly with one click. Sure, it took a while, because these were large JPEG files shot with a Canon EOS 5D, but the result was still ***perfect***.



Photoshop CS3 Photomerge dialog box offers five different ways to align images: Auto, Perspective, Cylindrical, Reposition-only, and Interactive Layout.

Joe set the Color Balance to Daylight for this three-shot panorama of the Westminster, Colorado City Hall that was decorated for the holidays. Exposure was 0.5 second at f/5.6 and ISO 200. Lens was the EF 22–55 mm f/4.0–f/5.6 zoom at 55 mm. ***Tip***: When you are leveling the camera, you may need to raise the tripod to its fullest height. © 2006 Joe Farace.

Because sometimes you have to photograph the landscape you have, not the landscape you want, Joe decided to shoot this one in black and white using the Canon EOS 5D's Monochrome mode. Base exposure for the four shots was 1/100 sec at f/22 at ISO 200. He used his favorite cheapo pano lens, the discontinued EF 22–55 mm f/4.0–f/5.6 zoom at 55 mm. © 2006 Joe Farace.

Alternate supports

If you're caught without a tripod or monopod and need stability, there are lots of options within reach. A person can easily become a human tripod. By standing with feet spread apart, elbows tucked into the abdomen area, cradling the camera with the hands, you can form a basic tripod. Slow, deliberate,

This candlelit memorial was on the front counter of an office. In respect for the young man whose death was being mourned, Barry asked permission to take the photograph while on assignment for the Colorado Health Foundation. With permission given, he quietly braced himself as described above, cradling the camera with elbows in tight, feet apart, tripping the shutter release as he slowly exhaled. © 2005 Barry Staver.

Some subjects require a delicate approach—or, shall we say, a keep-your-distance approach. Barry didn't want to take time to set up a tripod, let alone attach a monopod to his camera. He stayed in his car, rolling the window down, bracing the 300 mm f/4 lens on the window ledge of the driver's door. The final steadying touch: turning the engine off to eliminate an obvious source of vibration. © 2005 Barry Staver.

deep breathing will further aid in stabilizing the camera. The human tripod gains even more support when you sit down and place your elbows onto the top of your legs. If possible, lie on the ground with your elbows resting on the ground. Walls, trees, and large rocks all become good supports to lean against. Good stability can be found on adjacent flat surfaces. Set the camera down, activate the self-timer, or gently press the shutter release.

7 Available light photography at weddings

Now very often events are set up for photographers. . . . The weddings are orchestrated about the photographers taking the picture, because if it hasn't been photographed it doesn't really exist.

—Elliott Erwitt

Every topic that's covered elsewhere in this book, including the next chapter of RAW-format capture, comes into play for wedding photography. Couples often want portraits taken during *The Golden Hour* of sunset and ceremonies and receptions take place indoors, necessitating camera supports, fast lenses, digital noise reduction, and RAW-image capture. It's also important to know basic exposure and White Balance techniques, too. Making use of light and shadow is the key to creating beautiful photographs that couples will cherish after their wedding, photos that become heirlooms for the new family.

Long gone are the days of the traditional wedding photographer who arrived with bags of medium-format camera equipment, one or more flash units, a tripod, and a few rolls of film. The routine involved taking the same prescribed number of posed,

Every wedding provides exciting available light photographic opportunities. The bride had walked down this aisle only minutes before the photograph was made. Yet in her excitement and anticipation, we doubt that she remembered any of the details. This isn't a photograph likely to be ordered as an 8 × 10 print for the wall, but it's a scene-setting image that will blend with others from the day to tell the story. © 2005 Barry Staver.

set-up photographs at each event. Some photographers even worked with a checklist! There was no deviation and every bride's wedding album looked like the next. These traditional posed photographs included the following:

1. Bride and her mom before the wedding, either adjusting the veil or applying lipstick. This lipstick image was often taken into a mirror, showing both front and back of the bride's dress.
2. Groom, generally looking at his watch, in feigned anticipation of the big commitment he was about to make.
3. Bride and her dad, frozen in time by the flash exposure, as they began the walk down the aisle.
4. One, and only one, photograph of the actual ceremony. It was taken from the very back of the church, with camera mounted on a tripod, and the exposure was quite long, because most church interiors are dimly lit.

This image was made at a popular Colorado wedding site for ***summer*** ceremonies that overlooks the Continental Divide. In the winter months, it's buried in several feet of snow. After the formal portraits were taken, and as the guests departed for the reception, the couple stayed behind for their own quiet time. Without interrupting or closing in on them, Barry took this photograph with a 70–200 mm zoom lens. The telephoto lens compressed the distance between the couple and the mountains. The cropping is loose enough to give a sense of scale between the bride and groom and their outdoor surroundings. Notice that the bride's back is to the camera, the groom's face is partially hidden—they're not posing—and yet it's her favorite photograph. She loaded it onto her work computer as a screen-saver image, reminding her of the wedding day every day. © 2004 Barry Staver.

5. One photograph of the bride and groom walking up the aisle, again taken at the back of the church. The flash exposure certainly caught the bride and groom, but the rest of the scene was lost to darkness.
6. A photograph as the bride and groom prepared to drink champagne together. The photographer arranged this scene, instructed the couple on intertwining their arms and stopped them just as the glasses reached their lips. *How cruel!* With the chilled champagne just inches from the mouth, these couples had to stop and wait for the picture to be taken before enjoying.
7. The next planned photograph involved cake cutting. Once more orchestrated by the photographer. He or she would position the couple at the cake, even instruct them on best way to hold the knife. If that wasn't enough of an interruption, the couple was then instructed to cut halfway into

The kiss is one photograph not to be missed and it's such a beautiful photograph to take in real time instead of posed later. Each one is different. Normally, we crop tightly into the couple, but in this case the great joy on Father Ken's face adds a storytelling element that can't be left out. © 2004 Barry Staver.

In similar fashion, a tightly cropped kissing photograph takes second place to this image featuring the little boy's stare. © 2007 Barry Staver.

the cake, stop, look at the camera, and smile. We're not sure how many fingers have been nicked over the years as couples kept the knife cutting and looked up toward the photographer.

8. Of course the following photograph in the album showed the couple feeding the cake to one another. Yes, the couple was asked to get the cake right to each other's lips, and then stop, holding the pose.
9. The wedding-day interruption continued when the photographer posed the couple on the dance floor at the beginning of their first dance. All mood and intimacy of the moment was lost during the creation of this photograph.
10. Other traditional wedding "must-have" photographs showed the groom removing the bride's garter from her leg and the bride posing with the bouquet she's going to toss to the unmarried women at the reception.
11. Let's not forget the traditional posed group portraits, usually taken at the church altar after the ceremony. These included the bride and groom, the bride and groom with wedding party, and then with their respective families. Variations saw the bride with her bridesmaids, the groom with his groomsmen. Really daring couples had the photographer photograph the groomsmen lifting the bride completely off the ground and holding her in their arms. The bridesmaids were then photographed as they surrounded the groom. Sometimes the last two poses looked out of place at the church altar.

The new wedding photography

Fortunately for brides, grooms, and photographers everywhere, wedding photography has changed. Dramatically. In fact, with the integration of cameras into cell phones and the proliferation of small point-and-shoot digital cameras, some wedding photography has gone out of control. The pendulum has swung to the far end from the traditional list above. Wedding guests are standing up during the ceremony to take snapshots, and as the flashes fire in the darkened church, the mood of the ceremony is sometimes lost. In some cases, the number of flashes firing reminds us of the paparazzi scene around celebrities. Speaking of celebrities, did you know that some of them have installed metal detectors at their weddings? All guests are screened, and cameras—specifically cell phones with cameras—are taken away before the guests can enter. This prevents unauthorized and "bootlegged" photographs from being taken and distributed. Barry may be amazed that so many people would find celebrity weddings this interesting, but Joe agrees with Scott Adams, who says, "You can never underestimate the stupidity of the general public."

There is one big obstacle caused by guest photography that can hinder the professional photographer using multiple flash units that are being triggered with a slave or any kind of flash-sensitive triggering device. Depending on the sensitivity of the units, the guest flashes may trigger the professional photographer's lights, draining batteries and rendering those lights useless by repeated "unauthorized" firings. One foolproof way to avoid this: use infrared-triggered flash units or ones tripped with radio-controlled remote devices such as PocketWizards (www.pocketwizard.com) and RadioPoppers (www.radiopopper.com).

Many people claim to be wedding photographers, and we're not sure why they've chosen this particular specialty, because it's one of the toughest branches of photography in which to excel. Here's why: The wedding photographer has to be on his game for hours on end. In the corporate world of commercial and advertising photography, most assignments require prep time, setup, taking test shots, client approval, and often waiting. Waiting for something, someone. Waiting for the photo subject. In other words, the camera doesn't have to be in hand, ready to capture images, or taking photographs constantly. If you set the camera down at a wedding ceremony or reception, it's almost a guarantee that a photo opportunity will present itself and be missed. Corporate and magazine clients often need only one successful image for a cover, perhaps a few additional images for the inside pages. Weddings require dozens of successful images, especially if you're working as a storyteller.

Barry has no interest in pursuing celebrity clients, having dealt with so many of them during his tenure at ***People*** magazine. No security guard is confiscating cameras at the weddings he photographs, so he often finds ways to incorporate guest photography into his wedding-day storytelling. The guest with camera in hand on the right-hand side of the photograph adds depth and life to the shot. © 2007 Barry Staver.

Doing double duty: photographer and flower girl. The photograph was taken in the bride's suite while the ladies were getting ready. The bride, wanting her day documented as a photo story, appreciates these types of photographs more than the traditional posed photographs. The morning sun streaming through the windows behind her naturally lighted the scene. The shadow side of the scene was lightened using the Fill slider in Adobe Photoshop Lightroom and the Highlight Recovery slider was used to bring some of the out-of-range highlights into the acceptable range. © 2007 Barry Staver.

In an album layout, both photographs are used in a storytelling way. The girl is cute enough just using the camera, but this photograph completes the story, telling us what she was photographing. It also shows the detail in her dress, a very important detail for wedding photographers to include in their coverage. © 2007 Barry Staver.

All too often, the cake table is placed against a wall, forcing the couple to cut the cake with either their backs to the guests or allowing a partially blocked side view. The Boettcher Mansion, located in the foothills above Denver, places the cake table away from the walls. Barry wanted to show the crowd of guests gathered around the ritual of cake cutting and positioned himself behind the cake. The guests got their photographs, too (although Barry is no doubt in the background of all ***their*** images). He shot multiple images as the flashes fired from the guests' cameras. © 2004 Barry Staver.

Wedding photography has evolved in stages, in step with the prevailing camera technology of the day. As more photographers equipped with 35 mm cameras captured weddings, parts of the day were recorded as candid moments, eliminating the need for the interruptions and formal posing of the "traditionalists." On-camera flash was still employed, but photographs were being used to showcase the wedding in a more documentary style. The trend has continued into the mainstream, because many couples prefer the unobtrusive style of coverage. In addition to guests causing interruptions, stories abound of the overly aggressive photographer interrupting the service. One priest recounted a story to Barry about a photographer leaping over the communion rail, in the middle of the ceremony, to get a better angle, taking a photograph from behind the altar.

A helping hand. Reluctant flower girls get an escort to the altar from Dad. These moments happen in a heartbeat and can't be repeated, much less "staged" later. The storytelling photographer can't let down his or her guard for a minute. This moment happened, obviously, as the girls walked down the aisle. Barry was kneeling to photograph them walking toward the camera and rotated around when the wedding party started laughing behind him. Dad rushed forward to escort the girls the last few steps. © 2005 Barry Staver.

Isolated incidents like this, showing a lack of respect, have led many churches to *ban* professional photographers from the church entirely, or relegate them to back corners or balconies. Rules are now in place at some churches requiring that professionals not use flash during the service. Some churches even ask wedding photographers to sign documents holding them to the rules before being allowed to work in that venue. It's unclear what, if anything, might happen to a guest who violates the policy and Joe has asked many church officials this very question. The result is usually a blank look, but one minister made an announcement before the wedding asking guests not to take flash pictures. Guess what? They ignored him. So much for decorum.

New technology = new opportunities

The ability to set professional digital SLR cameras to high ISO (800, 1600, 2500, 3200, 6400, and now even 25600!) has opened up successful available light photography in even the darkest of

churches. Beautiful storytelling images are now being captured without interrupting the flow of the day. We doubt that it's eliminated the "leaping the rail" problem, however.

Camera advancements and improved technology have certainly made wedding photography easier from a technical point of view, but wedding coverage itself in general has seen major changes. The shift from traditional staged photographs has moved to documentary coverage, fashion-oriented portrait sessions with couples, fine-art style of coverage, and "trashing the dress," to name a few. This wide range of accepted wedding photography styles has opened the specialty to photographers who once shunned these events. The traditional photographer used two or three rolls of 120 mm film, taking at best 100 images. It's not uncommon today for a photographer to capture thousands of digital images at one wedding. Two or more photographers working on a multiday event can put 10,000 clicks or more on their cameras. The biggest hurdle for this new style of shooting is on the postproduction end. It's very time-consuming to download and back up large numbers of files; do the editing, sorting, enhancements of color, and density correction; rename and renumber; convert from RAW; and then upload to gallery sites. Making final selections for album design and the design work itself takes more time, and the fulfillment of print orders, if done in-house, continues to use up the clock. At photography conferences, seminar rooms are packed with photographers eager to learn one another's workflow solutions and the trade shows sport new companies and products being sold to address these issues.

Adobe's newest software, Photoshop Lightroom, is perhaps one of the best workflow solutions for the high-capture-rate photographers. It works as a database, building thumbnails, allowing many Photoshop and Bridge functions to be performed without opening individual files. Everything from color, density correction, cropping, highlight recovery, shadow opening, red-eye reduction, sharpening, and noise reduction can be accomplished. Once all the changes are in place, the Export command allows new files to be output with many Save options. The initial editing is a breeze, with multiple ways to filter images. Slide shows and Web pages can be created. The Print function will send data to your printer or make really slick PDF proof sheets.

Wedding-day coverage

Let's walk through a wedding as Barry might cover it. "Storytelling with a camera" is his tagline, as his lifelong style of photojournalism suggests. Keep in mind that the actual photography will be equaled or overshadowed by several other important components. The use of good people skills is necessary to

calm anxious brides and location scouting in advance will eliminate any last-minute surprises. Earlier this year, a bride and groom were going to see each other for the first time before the ceremony. This emotional and private moment is an important part of the wedding day and the location of this meeting was arranged the night before. On the wedding day, that space was still occupied by a corporate meeting. The ability to quickly and calmly find another location at the resort not only saved the day, but also provided a much more elegant and private setting. In fact, Barry now recommends this same spot to other couples.

Although the ceremony itself is usually only 30 minutes to an hour in length, a reception can last from two to six hours, or longer if there's a cocktail reception first or if the reception is held at a location that's different from the ceremony site. Wedding photography can be an all-day job. If the couple wants photography at the rehearsal and rehearsal dinner the night before and at a brunch the following morning, then it obviously becomes a multiday event. Preparation is based not only on this time factor, but also taking into account time of events for lighting needs, transportation to and from, even lodging for destination or late receptions.

The groom's first glimpse at his bride, whether it be at the altar or during a quiet moment before the ceremony, is as emotional a moment as any during the day. Barry encourages couples to see each other first, in a quiet place. It provides a wonderful photographic opportunity and makes it possible to do all the posed photographs right after, before the ceremony begins. This frees the couple to enjoy their reception with the guests. © 2007 Matthew Staver.

Digital capture makes his style of shooting go more smoothly than film-based photography. Barry brings all his equipment, including backup gear. The secret to his stealth working style means that he's not overloaded. He keeps with him only the lenses and accessories needed, sequestering everything else out of sight, but close by. His gear includes the following: three camera bodies (working with the second and third as backup), as well as lenses, lenses, lenses (including 15 mm f/2.8 fish-eye, 16–35 mm f/2.8 L II zoom, 24–70 mm f/2.8 L zoom, 70–200 mm f/2.8 L IS zoom, 85 mm f/1.2 L II, 100 mm f/2.8 macro, and the 1.4X teleconverter). Lighting gear consists of four Canon 580EX Speedlites, with Tungsten and Florescent color-correction gels for each; freshly charged batteries; two additional power packs; lightstands; and assorted clamps, brackets, and umbrellas. Lots of 2 GB and 4 GB flash cards are ready, having been *reformatted* from any previous jobs. They're kept in card wallets label-side up. As a card is filled and replaced in a camera, the filled cards are put into the wallets label-side down. This eliminates any chance of grabbing the wrong card in the heat of battle.

He'll include a reflector or two, tripod, monopod, battery chargers. All this is packed into Think Tank's International suitcase (www.thinktankphoto.com) and the Joe Farace backpack (www.adorama.com). This backpack, the lightstands, umbrellas, and reflectors then fit inside an L.L.Bean wheeled duffel bag. When he's shooting, Barry wears the Think Tank belt system. The pouches and lens bags are much better than toting a heavy shoulder bag or wearing a fanny pack. This belt system spreads the weight of the gear around the waist. A shoulder bag can easily bump into guests, chairs, and wedding cakes, or slip off the shoulder.

Because Barry's style is to produce a photo story with a beginning, middle, and end, photography coverage often begins before the wedding party arrives to get ready. Scene-setting images of the venue can be used as opening pages in an album, or as lightly toned background images behind the *getting ready* photographs. As the bride or her entourage bring the dress in from the car, or the groomsmen arrive at the site, it's easy to set the cameras to an Outdoor Color Balance and lower ISO setting. Once the action goes inside to the bride's room or hotel suite, a quick change to different White Balance and ISO is much easier than fumbling with film changes. Available light is Barry's preference for as much of the day as possible, although he'll have an on-camera flash with him to add some fill light as necessary. The Auto White Balance setting on the camera will produce acceptable or near-acceptable Color Balance even in the mixed-light situations where daylight is streaming in through windows to mix with the light fixtures inside. The majority of the time, the interior illumination is either tungsten balance (think traditional lightbulbs, spotlights) or fluorescent.

Photographing the bride's preparation usually involves working in the small space of a hotel suite or bride's room at a church. The room can be overflowing with moms, grandmas, flower girls, and all their stuff, depending on the size of the bridal party. Seldom is a long lens, such as the 70–200 mm, needed. A wide lens or wide-angle zoom and a mid-range lens should suffice. The 16–35 mm f/2.8 L II Canon zoom is a good example for the wide one and either the Canon 24–70 mm f/2.8 L zoom or a fixed-focal-length lens such as the Canon 85 mm f/1.2 L II should cover the long end. Don't overlook the detail-shot possibilities here, such as the bride's shoes, any special jewelry, heirlooms from a grandparent, and her gifts for the bridesmaids. The wedding dress can generate a beautiful photograph as it hangs or drapes over a chair or the bed. The photograph of the veil as it lay draped over the bed at the Grant-Humphries Mansion in Denver is made more interesting by the light pouring in from the window.

Shooting facial reflections in mirrors was part of the old-school wedding photography, but it can still be done—more effectively, we might add, using the available light around the mirrors. As a documentary photographer, you've got to work quickly to photograph both the full-length shot of the bridesmaids helping the bride make final adjustments to her dress and a tight close-up as they hook buttons. Using two cameras, with a different focal-length lens on each, is one way to accomplish this. The bride is always the main subject in wedding photography, but don't overlook the images of those around her, because they're an important part of the story as well. The little girl passes the time before the ceremony petting and photographing the dog. Morning light coming through the window provided the illumination.

It's a different story with the groom and groomsmen. They often show up already in tuxedos and it takes more patience to get the storytelling images as they hang out waiting for the ceremony to start. Using a second photographer at weddings is quite common, so that both bride and groom prep can be covered without missing a beat. Oftentimes colleagues with similar photography styles will help one another, acting as second shooters when they're not booked on the same day with their own wedding. This is a win-win situation because couples get extra coverage and the second photographer, without having the pressure of being the primary photogrpaher, has fun looking for interesting angles.

Tender moments can be photographed as bride and her dad prepare to walk down the aisle. The same holds true as you photograph the groom when he sees his bride for the first time, walking down the aisle. There are only a few precious seconds to swing the camera from the bride and her dad over to capture the groom's expression.

If the church allows the photographer to roam about during the ceremony, it's a good idea to get a wide-angle view from the back,

as well as the tightest shots possible of the couple at the altar. Ceremonies can provide the greatest lighting challenge. The altar is often backlit with spotlights or large windows placing the couple into silhouette, making it necessary to manually increase the exposure. This can be done using the Exposure Compensation adjustment on the camera or setting the camera to Manual mode and increasing the exposure beyond what the in-camera meter says. This will overexpose that bright window behind the couple, but provide the detail necessary to see the exchange of vows.

Be ready for the unexpected moments: Tears can flow, rings can slip from fingers, or flower girls and ring bearers might do something funny. Often the bride or groom will create a mischievous moment of their own. If the camera's not up to your eye, you'll miss these memorable images. No two weddings will ever be the same. If you've been given the green light to move about the church, it's worth photographing from the sides of the altar. Not only can you get great individual photographs of either the bride or groom, but you can capture the families seated in the front row. Once the "I do's" have been said and the officiator pronounces the couple "husband and wife," it's time for the kiss. The guests may applaud and begin to stir a bit. It's the sign to move in closer and even use the flash for added light. It's best to stay close to the couple as they leave the ceremony. This provides wonderful natural photo ops because they're letting down after the big ceremony.

How happy will this bride be to know that her family's being photographed during the ceremony? Juxtaposing the family images on one page of an album spread opposite the bride and groom at the altar gives the photo story more content.

The family portraits are most often taken between the ceremony and reception. If they're taken at the altar, additional lighting is usually needed. Digital photography makes this part of the day easier than ever. Barry sets up his tripod and attaches one of his dedicated on-camera flash units to the camera, setting it to the Master mode. This speedlight will control a second dedicated speedlight set on a lightstand. This second light will be bounced into an umbrella and positioned about 45 degrees off-camera on the groom's side of the photographs. This is important. The light must be on the groom's side of the church because they're usually wearing the dark tuxes that need more light than the bride's white dress. It's the best way to get properly exposed group portraits. If you're fortunate enough to be taking these formal photographs outdoors, open shade, sidelighting, or backlighting are Barry's preferences. Anything *except* full front lighting will reduce the squinting and tendency for people's eyes to be closed during exposure. The biggest challenge with group photos is getting all eyes open when each photograph is made. The dedicated on-camera flash can be used outdoors to fill in the shadows under eyes and add a bit of "snap" to the images.

Late-afternoon sun provided the main light source, but it is a cross between sidelight and backlight. A light-colored wall of the hotel complex at the Five Star Broadmoor Hotel in Colorado Springs, Colorado (behind the photographer) became a giant reflector, lighting the bride. This and the following photograph were taken by Matthew, in his role as second photographer. He's able to move about capturing candid moments and unusual angles, while Barry arranges and photographs the formal posed shots. © 2007 Matthew Staver.

Off to the reception

We're off to the reception and this means changing gears. It's time to regroup, check remaining battery life on the cameras, and check flash-card capacity. If either are low, it's better to change them now than to miss good photographs later when a battery dies or a flash card reaches maximum capacity, registering full just as a great reception moment is about to occur.

Brides love detail shots. They've been planning this big day for months, down to the last aspect, yet don't often get to see the reception room in all its splendor before the guests enter and make themselves comfortable before the bride arrives. These are some of the toughest photographs to take, only because of timing and logistics. Many venues don't have the room completely ready until mere minutes before opening the doors to guests, and serving staff are frantically moving about placing items on tables. Now's the time to make good use of a *second photographer*. A variety of photographs are needed: wide-angle views of the entire room; tighter shots of individual tables; the centerpieces; any special favors or items at individual places; the decor at the head table; and, last but not least, the cake table. Here are several detail photographs to show the variety of images possible. Barry often

It goes without saying that the cake and bridal bouquet are must-have detail photographs. Showcasing the bride's Vera Wang gown isn't a bad idea either. © 2007 Matthew Staver.

This photograph of the bride's hand being stenciled with Indian henna painting was used as a two-page spread in her album. © 2005 Barry Staver.

Not only does this image capture the veil, but it also takes on a fine-art quality with the strong window lighting. This is the lead photograph on a two-page spread, with additional images showing the bride and her mom getting ready. © 2006 Barry Staver.

This tender moment between the bride and young guest happened right before dinner was served. Working from a short distance away with the 24–70 mm f/2.8 L lens allowed the scene to unfold, uninterrupted by the photographer. Had either the bride or girl noticed the camera, what might have happened? One scenario would have both "ham it up" and smile for the camera. The second option would have the little girl turning shyly away. Not only would the photographic moment be lost, more importantly, the intimacy of their time together would be lost. Often this type of scene results in Barry's capturing several images and one of those will stand out over the rest. This is the strongest of the sequence, because others taken seconds before didn't have the same closeness or facial expression. © 2007 Barry Staver.

uses a tripod because exposures can be long in the darkened room. A macro lens is perfect for the extreme close-ups, especially table favors, place-card tags, and cake detailing.

It's interesting to note that as well planned and timed as these events are, photographers should always be ready for the unexpected. Moments of great tenderness, joy, or more can happen in the blink of an eye. Covering the reception with your camera hanging by your side is a surefire way to miss these moments. Barry has a camera in hand all the time.

The action picks up during the reception. Preplanning ensures that the photographer will be in a good spot when the bride and groom are introduced and make their way to the head table. Dining rooms are often crowded, and moving between tables and guests is difficult. The wait staff compounds this difficulty once the dinner service begins, and that's a good time for the photographer to take a break. Besides, no one likes to be photographed when they're eating. It's important not to wander too far away, because couples do work the room, visiting with their guests as the meal concludes.

Every story has an ending, and patience is needed to wait for it to unfold. Sometimes it's a final dance between the bride and groom, or an emotional good-bye from well-wishers. A photograph taken from behind as the couple gets into a carriage or limo to "to ride off into the sunset" definitely fills the bill at the end of the album.

The Broadmoor Hotel is one of Colorado's most photogenic wedding venues and this photograph of guests listening to toasts not only shows the bride many of her guests, but includes the ambiance of the South Terrace Dining Room as well. Wedding guests like to photograph the cake-cutting and -eating ritual themselves and often crowd around the cake table, reminding Barry of his background in news photography. © 2007 Barry Staver.

Another example of being patient and alert; 10 or 12 exposures were taken as the bride danced with the young boy. Most were certainly acceptable and told the story of their dance, but this image stands above the rest because it's the only one of the series where the boy's feet leave the ground. This small feat brings additional life and vitality to the moment. © 2005 Barry Staver.

This photograph was taken after all the guests had departed, leaving the bride and groom alone. They danced together for one last song, totally unaware of the waiters and waitresses clearing off the tables in the background. This background actually gives the photograph more interest than one of the couple alone. Barry would never stage this scene. The light level was very low, and not knowing how long the couple would dance, he didn't dare go across the room for a tripod. At first, Barry wished the staff weren't working in the background, but then he realized how much they added to the shot. His exposure was 1/6 of a second at f/2.8, ISO set to 1600. Experience told him that camera blur was going to be an issue, so he took approximately ***50*** images of this scene. From that original 50, only 2 shots were usable, and this one was just right. The couple was sharp, with neither one facing away from the camera. The digital noise in the photograph was reduced from the RAW file with Adobe Photoshop Lightroom. A perfect ending to a joyful celebration. © 2007 Barry Staver.

8 RAW-image-file capture

Along with a strong belief in your own inner voice, you also need laser-like focus combined with unwavering determination.

—Larry Flynt

The most important thing to keep in mind when reading this chapter is that we have tried to provide enough information about the choices you can make while working with RAW files so that you can make up your own mind about how to produce the best-looking images from your photographs. This is no "my way or the highway" approach here. Every reader's image files and needs are different—and out of necessity, your choices and decisions will be different from ours. From time to time, we may tell you how we *prefer* to do something, but this in no way represents the only way to accomplish that particular task; it's just our preference. Yours may be different. Our advice is to use all of the information that's contained in this section to explore the capabilities of RAW-image files to create your own unique vision.

Paper or plastic?

As we've mentioned in previous chapters, digital photography has made life so much better. The ability to select an accurate White Balance, choose the most favorable ISO speed, view

images on the fly, to name a few. To put these tasty morsels into play, we've had to expand our horizons and elevate our learning curves. Are you ready for more? Hang on to your hats, because here we go again. JPEG or RAW?

This time we'll be dealing with the actual quality of the image as it's captured by the camera's image sensor at the moment of shutter release. Equally important is the array of postproduction options that RAW capture offers to us. There is a difference between these options of quality and of course the trade-offs that accompany our choices. Who said this digital photographic life would be easy? What we'll say is that understanding RAW capture will impact, enhance, and streamline your postproduction workflow and provide you with the best insurance policy available for your image making. Yup, I doubt that Lloyd's of London could do you any better.

The "professional" line of SLR digital cameras, their "prosumer" cousins, and more and more of the digital point-and-shoot cameras allow the photographer to choose the image quality.

As we've discussed, that ***Golden Hour*** doesn't really last 60 minutes. Sunsets quickly turn to twilight, and the light changes accordingly. This scene was shot in JPEG mode only because there were precious few seconds of sunlight left. It was a race against the clock as Barry and his subject were driving back to the large boxed trees. The road was rough, the four-wheel-drive vehicle bounced to a halt, and the two of them ran to the trees. Only three or four frames were taken before the last ray of direct light left the scene. There wasn't any time to select RAW mode in-camera. Sound familiar? Ansel Adams's famous photograph "Moonrise, Hernandez" was made under similar conditions. Adobe's Photoshop Lightroom software was used to alter the photograph's color temperature and saturation before opening the file in Photoshop for additional work. © 2005 Barry Staver.

Basically, the choice is between JPEG mode and camera RAW mode, with several overlapping options thrown in. The option to shoot in TIFF format remains for some models and more-modern cameras even let photographers set their cameras to capture both RAW and JPEG images *at the same time*. Remember, we didn't say this was going to be easy.

JPEG is an acronym for the Joint Photographic Experts Group, the name of the committee that created the standards in 1986 for still-image compression. According to wikipedia.org, "JPEG itself specifies both the codec, which defines how an image is compressed into a stream of bytes and decompressed back into an image, and the file format used to contain that stream." Your camera makes adjustments to maximize the data, eliminating colors the eye can't see, and then compresses the image with a reduced color depth to save the file in JPEG format. Because this process discards what it decides is *redundant* data, JPEG is referred to as a lossy (not lousy) format. Keep in mind, however, that when the file is opened in a computer, the lost data is for the most part rebuilt, especially if a low compression ratio was used.

Unlike JPEG, RAW is a format that requires little or no internal processing applied by the camera. These files also contain 16-bit color information, which provides more data, but that data now requires external processing. When choosing the RAW setting, all of the raw data from the camera's imager is saved without any kind of processing. Effects such as Contrast, Saturation, and Sharpness are *not* applied to the image file.

Perhaps these food analogies will help explain the difference between a RAW capture and a compressed (JPEG) capture:

1. Cake. You can purchase a ready-to-eat cake in the bakery department of most grocery stores or you can make one at home from scratch. The store-bought cake is like the JPEG, because most choices are made for you. The bakery decides what ingredients to add, in what quantity, to meet their standards. You take it as is. JPEG photographs are processed in-camera, compressed. You take it as is. On the other hand, the made-from-scratch cake allows you to choose the ingredients, altering here and there to suit your personal taste. The same thing goes for the RAW images. You decide in postproduction.
2. Chocolate-chip cookies. Off-the-shelf Brand X, Y, or Z. The chips are already baked into each one, the softness of the cookie is predetermined, and all are uniform in size. This is the JPEG version. Baked at home with almost any recipe gives you these choices: type of chocolate (semisweet, dark, or white), the number of chips to fold into the batter, and the size and shape of the cookies baked. This is the RAW version. *Now I'm hungry—Joe*.

What's behind door no. 1

Before you open the door to RAW nirvana, it's nice to have some idea of what's on the other side. When translating RAW-image files, you're going to have to deal with some technical decisions such as bit depth and color space. If you're not always familiar with these terms, this chapter provides some background to help you make decisions about what's best for your photographs.

The simplest answer to "How many bits is enough?" is: The more bits you have, the higher quality you'll get. Think of the decision as another version of one facing film photographers. If a landscape image made with 35 mm film looks great, it will look even better on 4 × 5 sheet film and even better than when shot with an 8 × 10 view camera. Capturing these larger film images isn't easy. You can hardly pack an 8 × 10 view camera in the same case as a professional digital SLR. Also, as the physical demands increase, so does the cost of processing these large film images. Not only that, but storage becomes an issue too. Get the picture?

Big digital capture files equal more issues. The secret in making it all work is to find a balance between image size and quality—a balance that fits your workflow and expectations. Hey, did I mention cost, too? Much as an 8 × 10 Sinar view camera costs more than a 35 mm SLR, the digital tools needed to work on large image files are gonna cost you more, too.

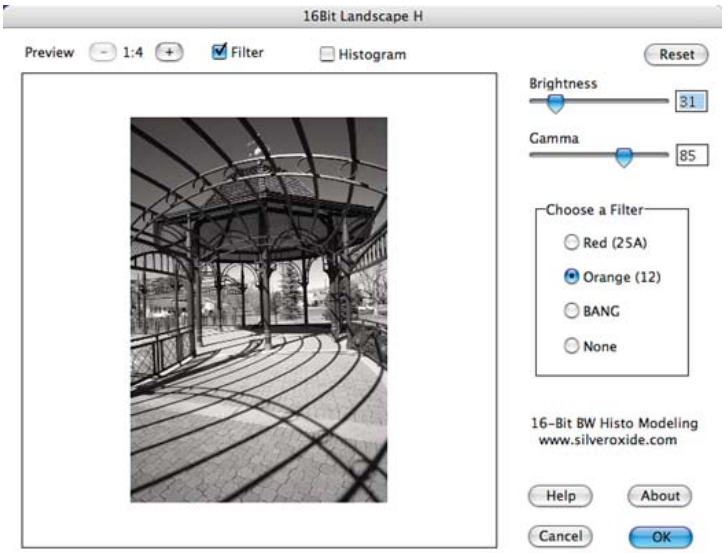
The upside of working with 16-bit images is theoretically better image quality. I say *theoretically* better because it's still up to you to capture a properly exposed and sharp image. The oft-heard quip, "Just shoot it—I'll fix it later in Photoshop" doesn't work if you are striving for maximum image quality. Because you start with a larger image file, there is less image degradation that can be created by the inevitable rounding errors that occur when a file is processed in an image-editing program such as Adobe Photoshop. Image manipulation using 16-bit techniques also takes advantage of Photoshop's floating-point operations (that's the math that happens inside the program; which is why there can be rounding errors), which produce smoother histograms and tonal transitions.

The downside of working in 16-bit mode is that fewer tools, especially third-party plug-ins or "power tools," are available to work in that mode. Then there is the "Hulk" factor: bigger files take more space and demand more computing resources. That bargain computer you bought at Crazy Charlie's Flea Market

ain't gonna work that fast with 16-bit files, so you're gonna need a state-of-the-art fast microprocessor chip in that computer, BIG hard drives, and recordable DVD drives to store these puppies. At some point, you will need to do something you may not be able to accomplish at 16 bits. When that happens, you should save a copy and convert it into 8-bit mode, retaining your original 16-bit file in the project folder.

Here's what the Filter menu looked like in Adobe Photoshop when a 16-bit file was opened. As you can see, many of Adobe's plug-ins—as well as most third-party compatible plug-ins—are not available.

SilverOxide (www.silveroxide.com) offers a family of Photoshop-compatible plug-ins that allow digital images to emulate the tonalities of "real" analog film, such as Kodak's classic Tri-X or my favorite Panatomic-X. Their 16-bit Landscape filter includes typical filter options, such as red, orange, and the ubiquitous none, but a new, purely digital filter called BANG (Blue Algorithm Neutral Gray) acts like a polarizer. © 2004 Joe Farace.



Making the decision

JPEG images have a lot of in-camera processing done to them and then the file is *compressed*. RAW images have virtually no in-camera processing, no compression, leaving that to you in postproduction. The choice is yours: let the camera decide or you decide. Is image capture using one method better than the other? Assemble ten photographers in a room, ask the question, and be prepared for up to ten different answers. There are times when the JPEG-compressed mode is an absolutely fine choice. Because each image is compressed, the file sizes will be smaller, and you can store more per flash card. For sports and action photography, you can fire longer bursts without fear of overrunning the camera buffer. You'll get quality prints thanks to the high-quality digital sensors in today's cameras. You can eliminate the postprocessing step and proceed straight to printmaking, Internet upload, e-mailing, or client delivery.

One big argument against RAW capture was the increase in postproduction processing time. Software today has greatly reduced this time constraint, helping to speed the process. Each camera manufacturer has proprietary information within their camera RAW settings and the file extension makes it easy to tell which camera was used to take a photograph. Canon files have a suffix of .CR2, Olympus files end in .ORF, Pentax files end in .PEF, and Nikon files end with .NEF. All of these camera companies have their own proprietary software for processing their images and the files are not interchangeable between manufacturers. Fortunately, Adobe and other companies have software that will process a variety of RAW images. As you'd expect, each new version or update improves, refines, and speeds the process.

Editing RAW or JPEG images in Adobe Photoshop Lightroom doesn't change the original files, because one must output the image as a new file. This makes it easy to rework older images with new technology. This JPEG photograph was revisited in such a way to adjust the shadow detail, Color Balance, and cropping without impacting the original. Output has been in several formats, including CMYK for inclusion in this book and for a marketing postcard. © 2005 Barry Staver.

Barry has cut down the time spent in Photoshop by 80 percent since he's been using Lightroom. There's no need to open individual images in Photoshop for simple corrections or even for cropping. By saving the file as a new, cropped version, this cute photograph of a small boy helping set out mats for a yoga class has been cropped in from the left without altering the original or taking additional storage space. If the client needs the image with the uncropped area returned, it's easy to recrop in Lightroom and then output it again. © 2007 Barry Staver.

While on assignment for an automobile magazine, Joe was told by the photo editor to shoot mostly JPEG files, but Joe was also told that he should shoot RAW files for any images that he thought would run over two pages. Exposure was 1/500 sec at f/10 and ISO 200. He didn't think this particular JPEG image would fit that bill, but that's exactly what happened; it ran as a double-truck spread. Go figure.

How's a photographer to know whether to set the camera to a JPEG or RAW capture setting? It depends on several factors: your expertise and comfort level in photography itself, the subject, the way you'll photograph the subject, the final finished product or outcome. The majority of Barry's colleagues in the wedding and corporate photography worlds shoot in RAW mode *all the time*. His colleagues in the editorial world, including the coauthor of this book, normally prefer JPEG. Some of their editors want the best of both worlds and so they require the JPEG/RAW combination. This allows them to edit through the JPEGs quickly, and still have the higher-quality RAW file for publication. This method requires the use of large-capacity compact flash cards. Barry prefers to work in both JPEG or RAW, but never combined on the same project.

Pros and cons

Here's a comparison between the two formats, together with advantages and disadvantages:

JPEG advantages

1. Smaller file size.
2. More images per memory card.
3. Faster writing to memory cards.
4. Immediate access to photographs, no postproduction software needed.

JPEG disadvantages

1. Camera software compresses each file.
2. Data is lost with this compression.
3. Less ability to make postproduction adjustments.
4. Less room for operator error with exposure, proper White Balance.

RAW advantages

1. No file compression. Capturing the full, unadulterated data from the camera sensor.
2. Ability to manipulate the files in postproduction.

RAW disadvantages

1. Larger file size.
2. Fewer images per memory card.
3. Slower write times to the cards.
4. Must have postproduction software to process the files and convert to a usable format.

Digital film?

If you used to be a film photographer, here's another way to understand the differences between the two modes: think about shooting color negative film versus color transparency film. Negative film is more forgiving of exposure and color-temperature variations. A person could under- or overexposure the image and still obtain a satisfactory print. The color could be somewhat improved as well and corrections could be made by the lab during the printing process. If you used color transparency film (slide film), the exposure and color correction had to be "on the money." A variation of one-third of an f-stop was the latitude limit of the film. The color temperature had to be perfect. Film processing could not salvage poor exposures or improve color correctness.

Shooting in JPEG is similar to color transparency film work. Exposures have to be nailed down and the White Balance set properly. If you shoot in RAW, your exposure and Color Balance don't have to be perfect, because you can make adjustments in postproduction. Remember, these RAW files are coming right from the camera sensor. There's no sharpening, noise reduction, or compression of the image.

Another question to address is the difference between the image quality of a compressed JPEG versus a full-sized RAW file. For casual shooting, projects that will require normal-sized prints, most reproduction in printing-press format, JPEGs will be great. Barry has made acceptable-quality wall-sized prints from 6.1-megapixel JPEG files that were 48 inches across. Mind you, it was nail-biting time waiting for the lab to make the prints. You see, two assignments were photographed in JPEG before he'd discovered RAW capture as part of his workflow. The clients surprised Barry with their requests for large prints. He was pleasantly surprised with the results, however, and both clients loved their prints. That means the 11×14, 8×10, 5×7, and 4×6 prints will rock. Barry routinely photographs studio portraits (on location, bringing his portable studio, including backdrop, to the client) using JPEG format because he controls the lighting, exposure, and

Color Balance, thus eliminating the need to make postproduction changes. By eliminating work after the fact, the print order goes to the lab quicker—and less time equals more money.

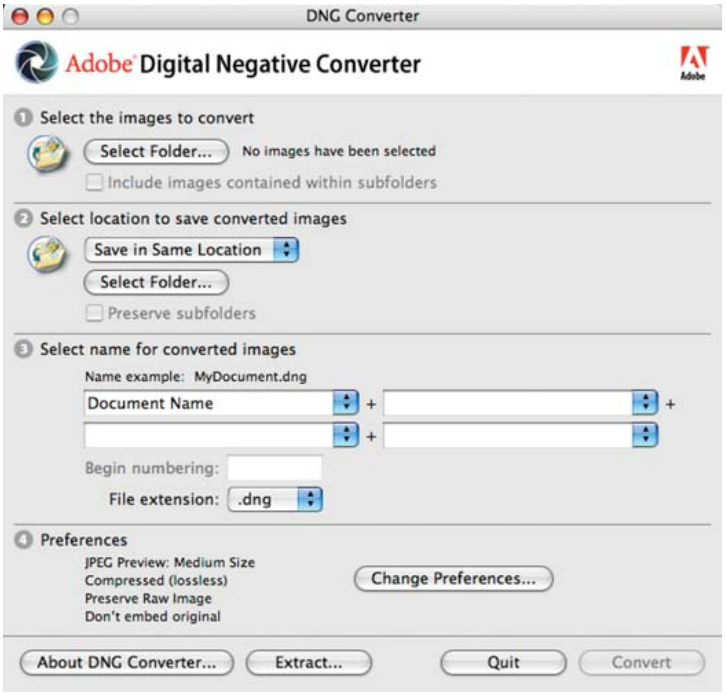
Most of Barry's and much of Joe's outdoor shooting is in JPEG mode because the lighting and exposure aren't that tough to manage. Interior shots, with a nonchanging basic light setup, are also JPEG'ed. Barry will switch to RAW capture when the lighting is tricky, Color Balance difficult and/or changing, and exposure likely to be changing quickly. This often happens, because he works and shoots "on the run" as a photojournalist. He might be running from room to room at an event and these rooms are all lit differently. Fast-moving subjects and events don't slow down for slowpoke photographers, let alone stop for Custom White Balance checks. As a photojournalist, Barry's main goal is to capture the moment. As you know, these moments come and go in a heartbeat and can't be restaged with any kind of authenticity. He'd rather get the shot and miss a bit with exposure, knowing that the RAW capture offers an insurance policy to help out. Barry will also use RAW, knowing that the end product will be large prints or reproduction, in a high-quality or large-format publication.

The ***Financial Times*** in London commissioned Barry to photograph world-class adventurer AnnaBelle Bond in Aspen, Colorado. She was being featured (in black and white) in their ***How To Spend It*** monthly magazine. Although he loves the features on his Canon cameras, Barry has never mastered the Picture Styles, preferring to shoot in color, converting to black and white later. The workflow on this assignment included taking test shots in the Picture Style mode of Monochrome to checking for contrast and exposure, but he switched back to Color mode for the actual photographs. Shooting in RAW mode gave Barry the easy task of converting his edited selection to monochrome in Adobe Photoshop Lightroom. © 2007 Barry Staver.

Mary Farace was working with Barry Staver on a wedding. Taking his advice, she captured this scene in an extremely dark church in RAW mode. Exposure was made with an Olympus E-500 at 1/4 sec at f/4.0 at ISO 1600. Image was processed in Adobe Camera Raw software, and cropped in Adobe Photoshop. © 2007 Mary Farace.

A good example is the work Barry has done in the health-care field at clinics, hospitals, and laboratories. In many of these situations, he was escorted into an examining room, operating room, or similar environment—with only moments to assess the surroundings, choose a White Balance setting, check exposure, and prepare for photography. Many examining rooms are lit with one overhead fluorescent fixture, but the actual exam lights have bright tungsten or incandescent bulbs. In other words, it's our old friend *mixed lighting*. Intensive-care units keep lighting to a minimum, requiring a high ISO, and no flash is allowed. Surgical suites have intense, focused spotlights to illuminate the surgeon's work area, making the rest of the room dark by comparison. Having the ability to recover lost highlights or open darker shadow areas from RAW files during postprocessing is a saving feature to Barry. The same scenario exists for wedding photographers, because the bride's white gown can really stand out against dark backgrounds or when she's next to the groom in his black tux. RAW capture gives the breathing room to make these assignments successes rather than failures. In fact, the Health Sciences Center at the University of New Mexico has won several awards for their publications that feature Barry's photography.

Before you can see the edges of your RAW file that are "hidden" by the camera, you will have to convert that file into Adobe's DNG (Digital Negative) format. To do that, you'll need Adobe's free Adobe DNG Converter (www.adobe.com/products/dng) that's available for both Mac OS and Windows and easily translates RAW format files from many of today's popular cameras.



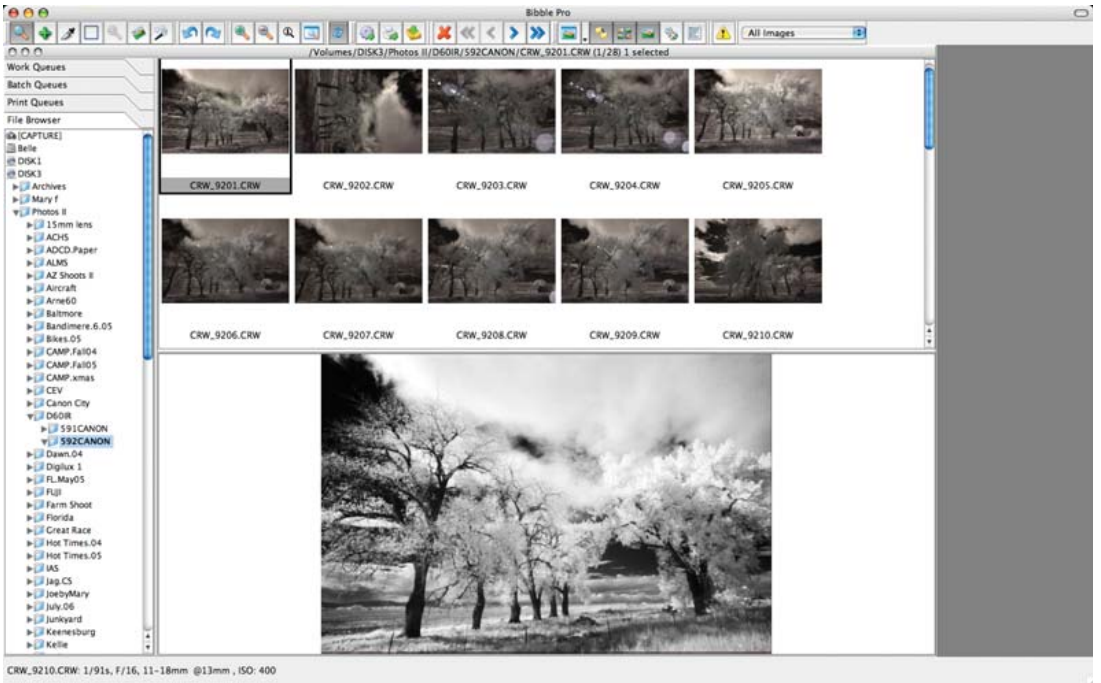
RAW: What's Missing

Thomas Knoll has created a new utility called DNG Recover Edges, which is designed to reveal pixels at the edges of RAW files converted into DNG format. These pixels are not available when these image files are displayed normally because the camera manufacturer masks off pixels at the very edges of the frame. One of the reasons is that sometimes the size of an image sensor doesn't match some of the accepted standard aspect ratios. DNG Recover Edges is a ***droplet*** utility that can recover between 4 and 16 pixels around the edge of the image. The Luminous Landscape photography resource site (http://www.luminous-landscape.com/contents/DNG-Recover-Edges.shtml) hosts the free, independently produced utility and provides additional information. Adobe's John Nack blogs that Thomas decided to write the utility after taking a photo of a bird that had its wing tip outside the frame. The extra 10 pixels he recovered in that shot were enough to include the entire bird in the shot.

RAW software

Once these RAW images have been captured, we're off to the kitchen, so to speak, to work our magic. Remember, these files won't work at the local photo lab for instant prints and won't open when sent as e-mail attachments. Windows users may want to download the *free* ArcSoft RAW Thumbnail Viewer plug-in (www.arcsoft.com), which displays virtually all RAW photo formats right within the Thumbnail view of Windows Explorer, instead of the default icon that Windows displays. RAW Thumbnail Viewer lets you browse and manage images without launching special software. Their thumbnail preview will be visible in a number of photo-browser software programs, but the images will need additional processing and a final step of outputting to a more universal file format (JPEG, TIFF, PSD).

After you've transferred the RAW files to your hard drive, they're available for any number of enhancements, changes, or conversions, individually or in groups. Adobe's Photoshop Lightroom is Barry's favorite and he's worked with Lightroom since its inception as a beta program. He swears by one of its strongest features: highlight recovery. Apple has Aperture software. Bibble (www.bibblelabs.com) also processes and converts RAW files. These programs allow you to make all of the adjustments, and more, that the camera would have made if JPEG files had been shot. It's possible to change the color temperature—Color Balance—and the entire image can be warmed up or turned cooler. The program's Eyedropper tool can be used to set a precise white point based on an area selected in the image. The overall exposure can be adjusted to compensate for an over- or underexposed image. The most amazing feature, in Barry's opinion, is the Highlight Recovery slider in Lightroom. It can bring back overexposed (blown-out) areas better than anything else he's seen. On the opposite end of the spectrum, the Fill slider opens up shadow areas, as if you had used a fill flash. Lightroom can add/subtract vibrance and saturation, and can convert the image to black and white.



Bibble Labs offers Bibble Pro software for RAW-file processing and includes support for many cameras, including the Leica R8 with Digital Modul-R, Pentax K100D and K110D, along with Lens Correction support for the Tamron 70–300 mm f/4.0–f5.6 LD.

Suppose you'd taken a lot of photographs that needed work and all needed the same adjustments. These programs allow you to make the corrections to one image and then select others for a "batch" correction. That's right, the computer will crunch the numbers, adjusting all, while you do something else. Images can be cropped, tilted, converging lines straightened, vignettes added around the edges.

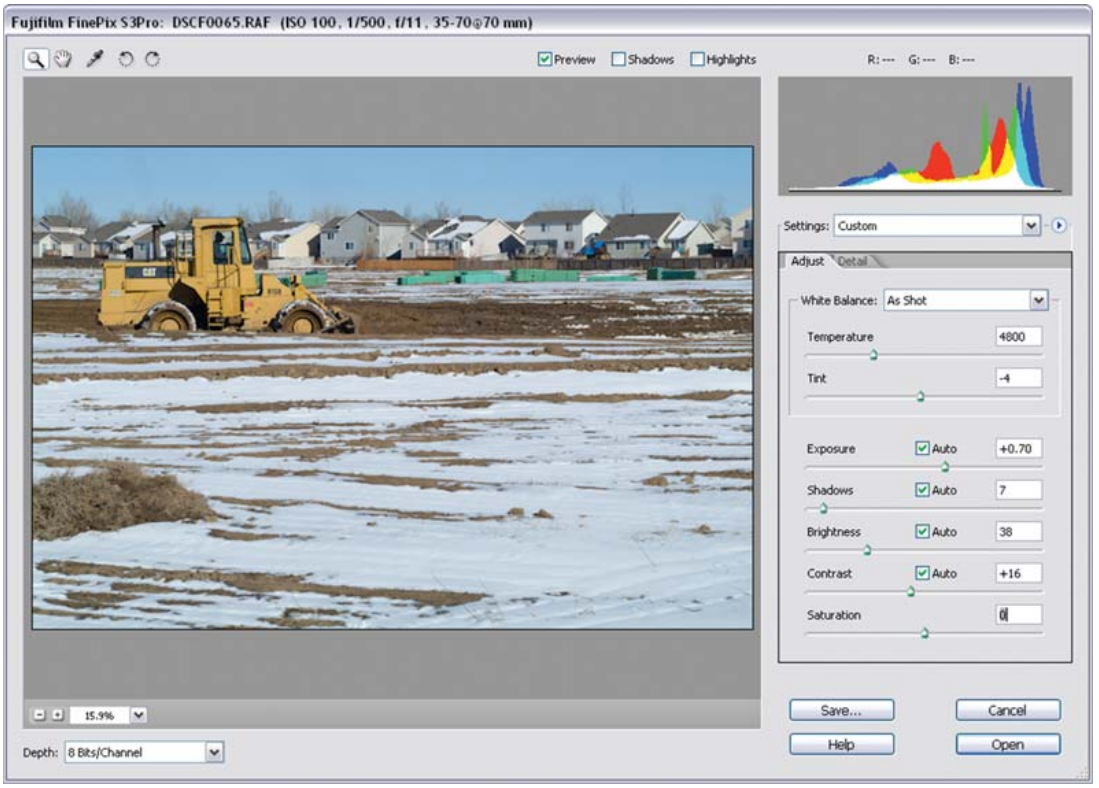
None of these changes will alter your original file. Please reread the previous sentence. The RAW file remains unchanged, much like an original film negative or transparency. It's your digital negative. The changes will take place when the program converts the image to a format of your choice, the same way a print appeared in the tray of developer back in the day.

It's possible to make several different versions of your image, saving each one as a new file, and again keeping the original intact. What about obsolescence? What happens when a camera company goes belly up or makes significant changes to its proprietary RAW-image algorithms? Adobe has provided us with a tool called DNG Converter to ensure our imagery against the possibility of being outdated. The *digital negative*, or DNG, is a way to convert any camera manufacturer's RAW

files into a digital negative that can always be opened and adjusted. Adobe makes the software coding available openly, so it can be used by anyone. Many photographers are saving their RAW files into this DNG for future preservation.

Adobe Camera Raw

Photoshop CS3 features the latest version of the Adobe Camera Raw, which nondestructively processes RAW data from your digital camera. Photoshop CS3 also allows you the flexibility of applying the editing power of Camera Raw to JPEG and TIFF files as well as RAW formats. Some of the enhancements to the latest version of Camera Raw include accelerated performance and a Clone and Heal tool that lets you retouch images before taking them into Photoshop. There are Fill Light and Vibrance controls to fine-tune lighting, intuitive monochrome conversion and control, along with precise color-adjustment controls. The latest version supports more than 150 cameras and is compatible with Lightroom conversion settings.



Best of all, you don't need the increasingly expensive Photoshop in order to use Camera Raw. The latest version of the $99 Photoshop Elements contains the latest version of Adobe Camera Raw as well.

Workflow: pictures, you've got pictures

One of the few problems with digital image capture is that you tend to shoot more photographs than you might otherwise do if you actually had to pay for processing them. (You really *have* to pay for all these extra images—there is no free digital lunch—but that's a topic for another book.) If you're going to make lots of pictures, you're going to need a process to manage them.

It all starts at before you begin making photographs. If you are shooting an assignment with specific sections or categories of shots, you may want to organize your images directly *in* the camera and *onto* your memory card. Every professional digital camera has its own methodology for creating folders and assigning image file numbers, so take some time to read the manual—it could save you time later in the workflow. If you can assign a group of image files from a particular sequence or event, as you shoot them, to a specific folder, you won't have to do so later in the workflow process.

You might want to consider how you set your file-numbering system too: most cameras give you the option of resetting to zero each time you insert a memory card, whereas others permit sequential numbering; some let you do both. Even if you're shooting on 4 GB cards, the choice of sequential file numbering avoids the problem of creating identical filenames and also keeps a running total of how many images you have captured with the camera. Those shutters won't last forever, partner, so think of it as an image odometer.

Get rid of the dogs right away. During a break in shooting, take some time to *chimp* your photographs on your camera's LCD screen, erasing those that don't make the grade. Don't be too hard on yourself (unless you don't have many memory cards)—you can keep marginal ones for later, more-critical evaluation or to be used to create composite images, something that I often do.

"Chimping," if you're not familiar with the term, is the behavior that some digital camera owners exhibit when looking at pictures on those very same LCD screens. Oooooh, ahhhhh, oooooooh . . . know what I mean, Vern? © 2005 Joe Farace.

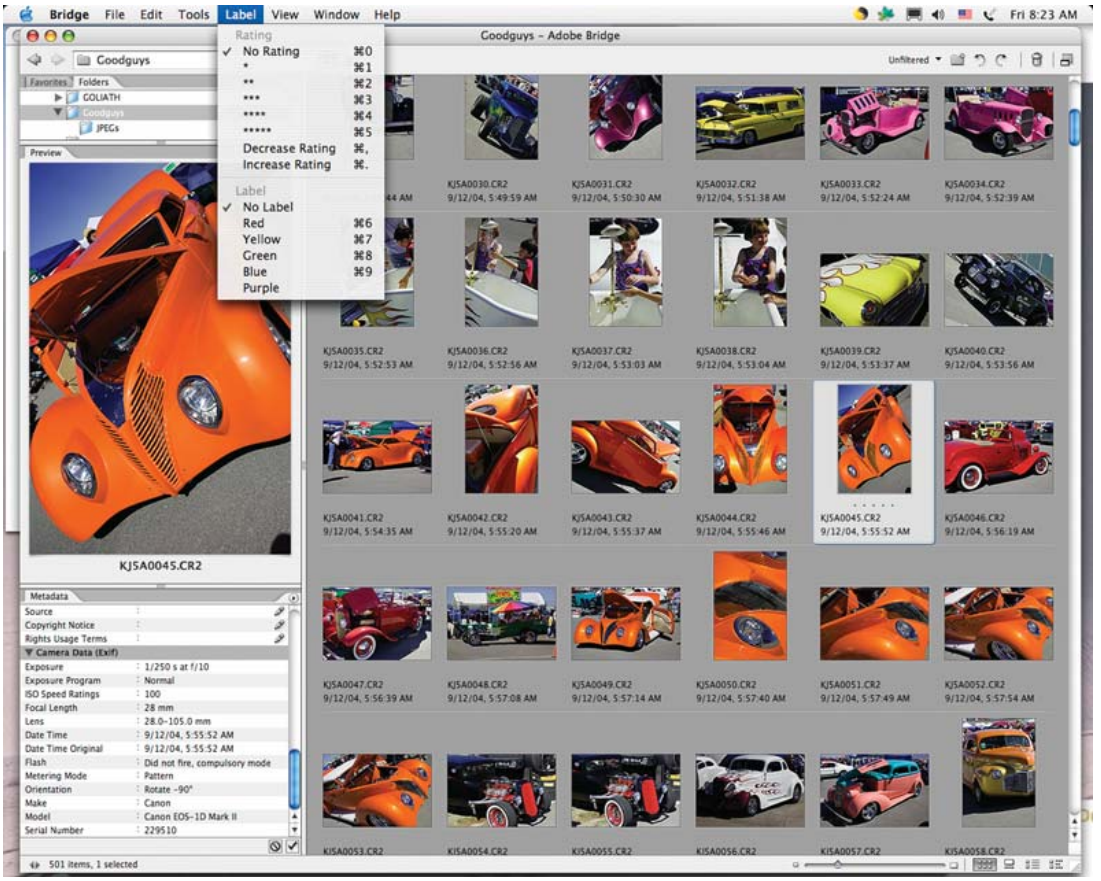
When you get back to the office or studio, it's time to copy the image files from the memory card onto your computer's hard drive. Unless you're using a USB 2.0 or FireWire device, transferring images via a typical card reader can be slow. USB 2.0 readers are inexpensive and fast, but make sure your computer has a USB 2.0 connection, not just one that's "USB compatible," which means the port is really USB 1.1 and is ten times *slower* than 2.0. You can inexpensively add USB 2.0 ports to most computers, so just do it. These cards for Mac OS and Windows computers are available from companies such as Belkin (www.belkin.com) and are easy to install even for the least technically inclined photographer. You have better things to do than wait for files to be moved from one place to another, so start by speeding up the process.

At this point, you should have all of your files in a single unorganized folder on a removable hard drive. Before doing anything else, your next step is to burn a CD—or, more likely, a DVD—of all files from the shoot. After the disc is recorded, test it to make sure it works and then label the disc. Then think about how you will find that CD/DVD next week or next year. *Tip*: Using Roxio's (www.roxio.com) Easy Media Creator software, Joe will produce a descriptive cover for the CD/DVD case that features a large picture from the shoot on the cover. That way, he can immediately see what images are inside.

Sort 'em out

Now's the time to edit anything missed during the chimping process, using Adobe Bridge or Barry's favorite, Lightroom. The first pass-through is quick, with the idea being to get rid of images that aren't technically up to par. If you have a question, set the preview window to a large size so you can critically evaluate the image. If it's not up to your standards, click the trash can icon and it's gone. But what, you ask, happens if it turns out that you can use *that* image later on? Remember that *all* of the files from the shoot—the good, the bad, and the ugly—are already backed up on CD/DVD. At this point, you're working with only those images that are stored on your computer hard drive.

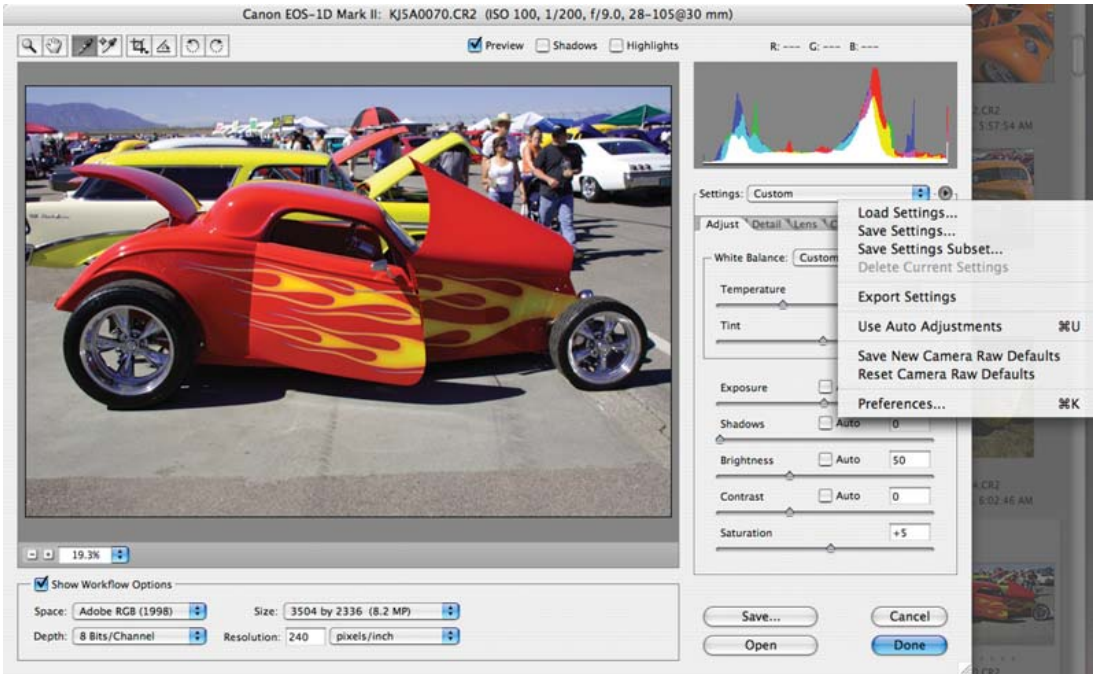
The next Bridge pass-through is slower and you should use the software's Label menu to assign ratings to the images. One star for marginal and five stars for "select." Be honest with yourself and give a five-star rating to only those photographs that are exceptional or exceptionally salable. At this point, you have many choices, but the main thing is to separate items by content and put them in folders whose names identify the content. In the photographs of the car show, Joe created three folders (inside the main shoot folder): Show Cars, Track Event, and Lifestyle.



Because Adobe Bridge lets you view thumbnails for RAW files, Joe prefers to sort them into folders before doing any kind of processing. Processing first seems backward, because you end up wasting time and hard-drive space by processing images that may not be worth your time. © 2006 Joe Farace.

Next, resize the preview palette to make it smaller, allowing you to see *all* the items in the folder view, and then drag them one file at a time or click-drag groups of image files into the folder by content. Once inside each individual folder, sort the images by their ratings so the best ones appear first in a Bridge view of that folder. At this point, the truly anal may want to make another CD, but Joe confesses that he waits until actually processing some of the files to do that.

While the files are temporarily stored on the hard disk, pick ones to crop, color-correct, or manipulate—those that, in general, will produce a better-looking, salable photograph. These retouched image files can be kept in the same folder as the originals and saved in Photoshop's PSD format, with all the manipulation



Joe doesn't process all the images, just the five-star ones. He starts by opening representative images—ones that can create a standard—that can be saved as a customized Camera Raw setting that can be later applied to similar images from a particular lighting situation. Joe prefers to let his images steep, much like a good cup of Earl Grey tea, until they have achieved some distance in time and space so he can really see the difference between a great shot and a so-so one. © 2006 Joe Farace.

layers intact, and still use the camera's numbering protocol by adding a "–1" or whatever. They are never sharpened or resized until you're ready to do something with a specific image. Then you can flatten the file (Layer > Flatten Image) and save it as a TIFF file.

When your internal hard disk starts to get crowded, look at the oldest folders. Before dumping them into the Recycle Bin; copy *all* the data, including the manipulated files, onto a new CD or DVD. I know some who use external FireWire hard drives, and when the drives fill up, they buy another one, keeping all their image data "hot." The choice of backup is up to you, but having the image data stored in two, maybe three different places is more than a good idea.

Did somebody say distribution?

What next happens to the images depends on the client or the final application. Joe also shoots for fun, calling it "stock photography," and treating the image files just as if they were

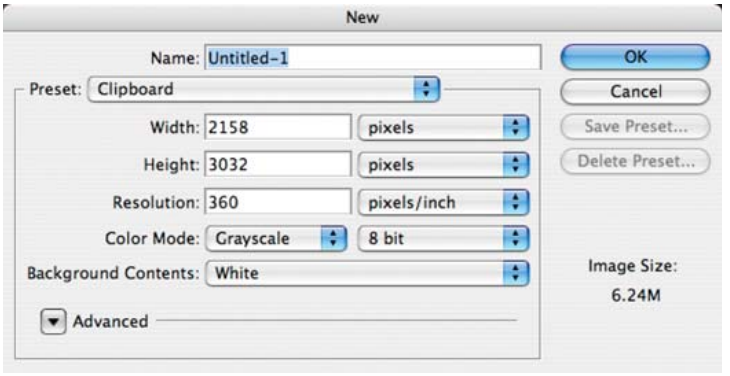
from an assignment or real stock shoot. In most of these fun shoots, he will capture images in the largest JPEG size. With cameras such as the Canon EOS-1D Mark II, the JPEG file is adequate for magazine reproduction even up to full-page bleed.

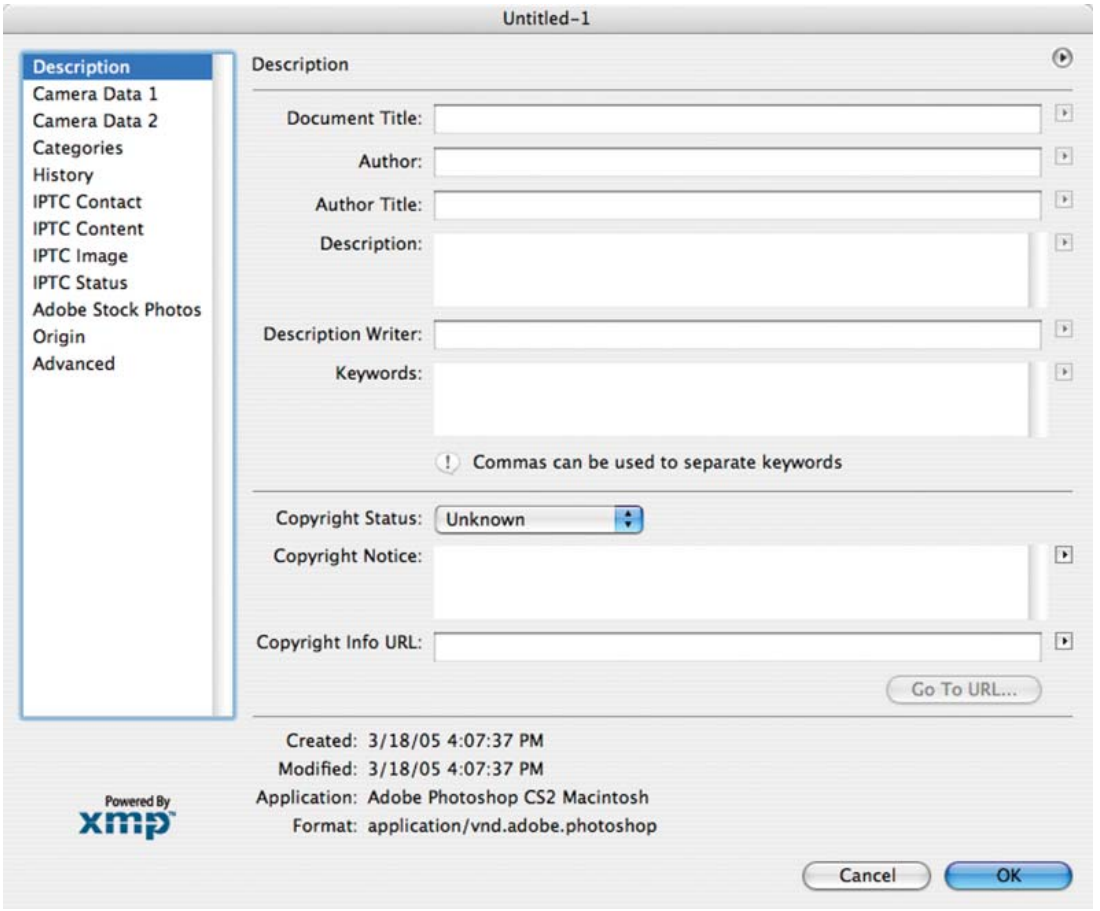
Sometimes a client needs just a single image and wants to see thumbnails for a really quick look. Using Photoshop's Save for Web command (File > Save for Web), you can create a few JPEG files that can be easily e-mailed. It's probably a good idea to use Photoshop's Text tool to add a copyright notice, not so much because somebody might steal the file—that won't stop a truly determined thief—but as a way to identify the file among the many the client may be evaluating. A far better way to protect your files is to embed your copyright data *inside* them.

Embed copyright with your files

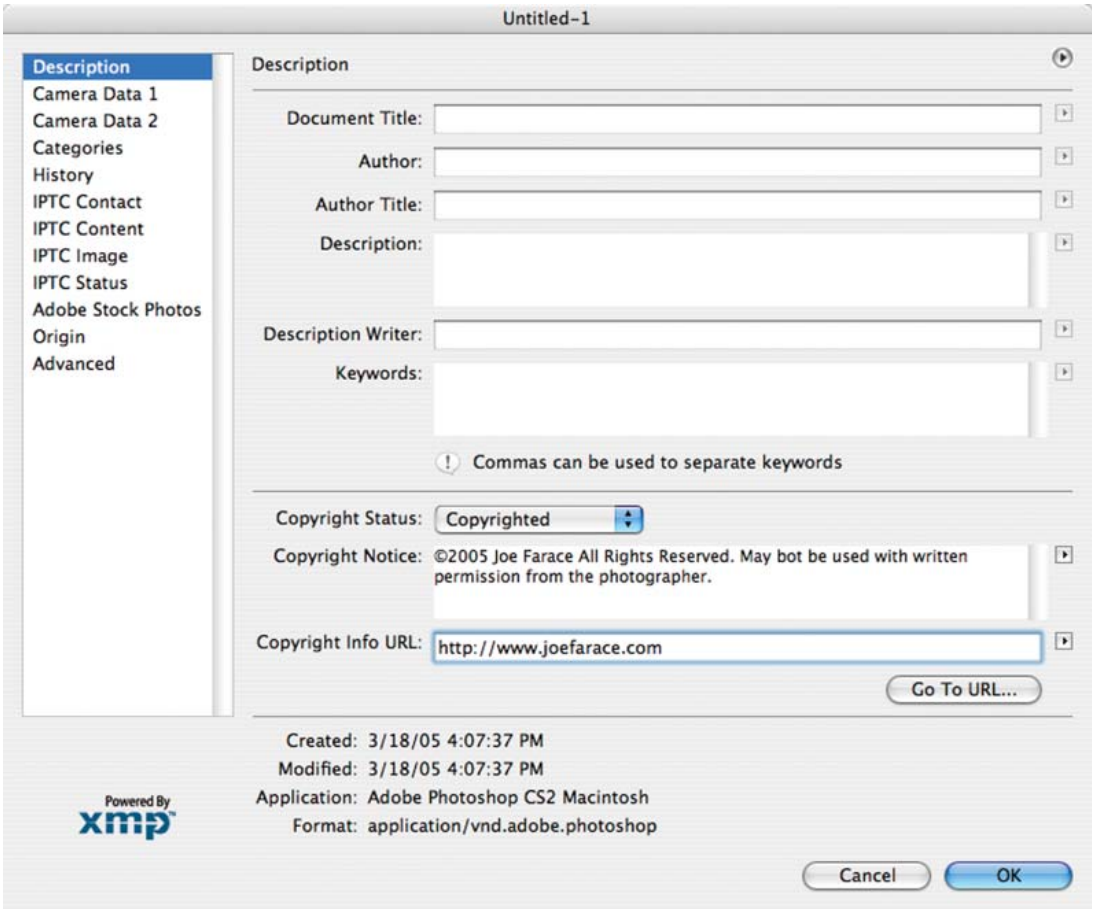
You might want to embed copyright protection into your image files even before you initially burn the files to a CD/DVD. The sooner you do it during the workflow process, the better protected you will be downstream. The process uses Adobe's Extensible Metadata Platform (XMP), which is built into Photoshop. XMP is a labeling technology that allows you to embed data, commonly known as *metadata*, into the image file itself. With XMP, desktop applications have a common method for capturing, sharing, and—most important to us photographers—rights management. Instead of having a big copyright notice obliterating the digital image, you can use the following steps to make your copyright notice an integral part of a digital file itself:

Step 1: Open a blank document in Adobe Photoshop. (File > New) and click OK.

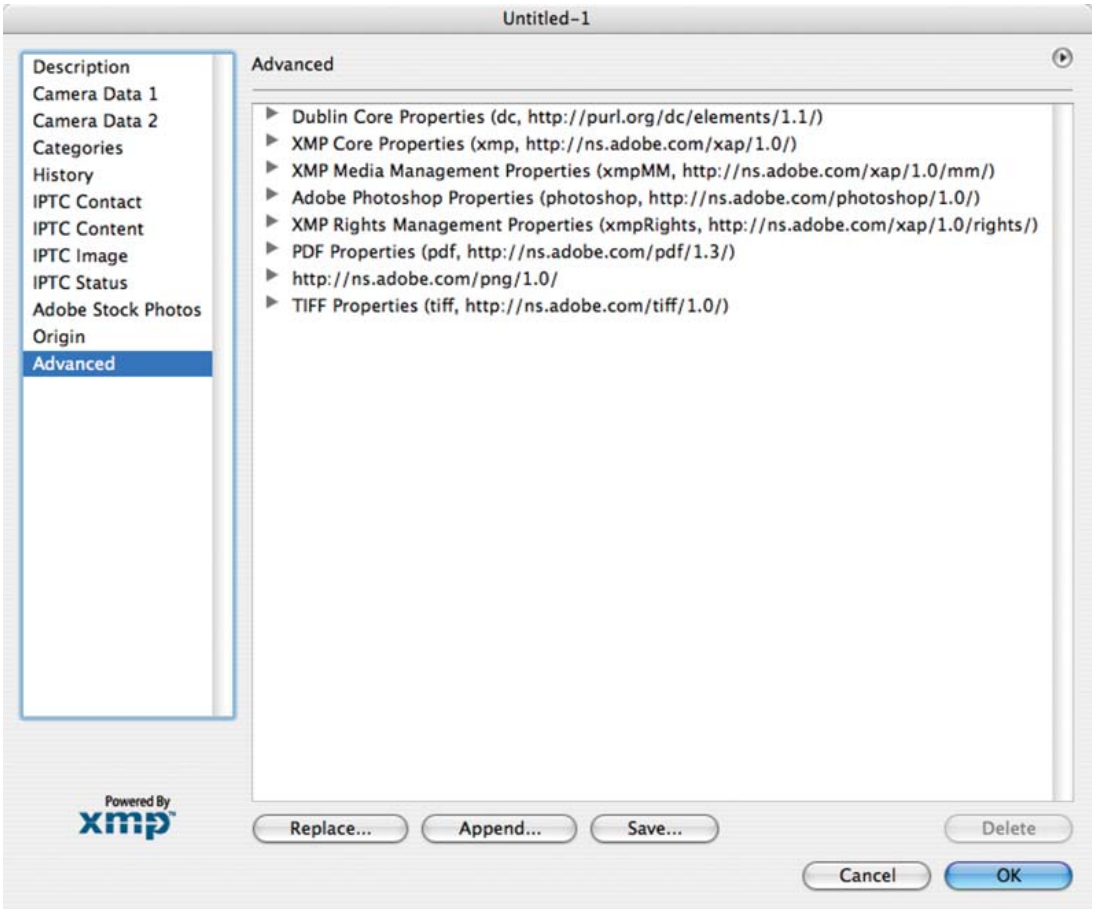




Step 2: Choose File Info from the File menu (File > File Info).



Step 3: Select Description in the menu on the left side, then chose Copyrighted from the Copyright Status pop-up menu. In the Copyright Notice section (below), type the information that you want to appear as part of the image file. You can include a phone number, © symbol, year created, "All Rights Reserved," or whatever you think is appropriate. Then enter your Web site information, if you have one (and if you don't, why not?), into the Copyright Info URL box.



Step 4: Choose Advanced from the menu on the left-hand side. (It's below Description.) Next, click Save and save an .xmp file containing all of this copyright notice data, using whatever name you prefer. Click OK on the File Info box.

Having to do this for each and every image file that you create would be tedious, so the best approach would be to create a Photoshop Action that would automate the entire process. This process then can be applied to an entire folder of image files. That way, you will have to go through the process only *once*. The next time you want to embed copyright information into an image file, just click the function key you've chosen, or click on the newly created button (when you're back in Button mode) in the Actions Palette, and it's done.

If you're interested in learning more about RAW capture, be sure to read *Raw Workflow from Capture to Archives* by Philip Andrews (Focal Press). In the meantime, *Happy Trails.*

Glossary

Experienced photographers may be familiar with traditional film-based terms and acronyms, many of which have their origins in the disciplines of optics, chemistry, and physics. The language of digital imaging has *its* roots in the fields of computing and commercial printing and has shown itself to be remarkably inventive in creating new buzzwords at the drop of a microchip. Here's a brief introduction to some of them that a digital photographer might find useful.

AF Autofocus, automatic motorized focusing.

AI Focus AF In cameras such as Canon's EOS-1D and 40D, this is an Autofocus mode that automatically switches from One-Shot Autofocus to AI-Servo Autofocus when a subject moves.

AI Servo AF Autofocus mode for moving subjects with focus tracking and shutter priority.

Aliasing Sometimes when a graphic is displayed on a monitor, you will see jagged edges around some objects. These extra pixels surrounding hard edges—especially diagonal lines—are caused by an effect called aliasing. Techniques that smooth out these "jaggies" are called anti-aliasing.

Analog Information presented in continuous form, corresponding to a representation of the "real world." A traditional photographic print is an analog form, but when this same image is scanned and converted into digital form, it is made up of bits.

Average metering Through-the-lens (TTL) metering that takes into consideration the illumination over the entire image.

BIT Binary digit. Computers represent all data—including photographs—using numbers or digits that are measured in bits.

Bitmap Collection of tiny individual dots or pixels—one for every point or dot on a computer screen.

BMP Often pronounced "bump," it's the filename extension for a Windows-based bitmapped file format.

Bracketing Time-honored photo technique where multiple images of the same subject are made at different exposure levels. The idea is that one of them will be the best and some may be acceptable. In Auto Bracket mode, the first frame is exposed with no compensation, the second is underexposed, and the third is overexposed. Depending on the type of camera you have, this order may differ, or may even be programmable.

Byte Each electronic signal is 1 bit. To represent more-complex numbers or images, computers combine these signals into larger 8-bit groups called bytes.

CCD Charge-coupled device. This is the kind of light-gathering device used in scanners, digital cameras, and camcorders to convert the light passing through a lens into the electronic equivalent of your original image.

CD-R CD Recordable. With these discs, you can write image-file data only once and read it many times.

CD-ROM CD read-only memory. A disc that resembles a music compact disc, but can hold all kinds of digital information, including photographs.

CD-RW CD ReWritable. You can write and read these discs many times, but the discs themselves cost more than CD-Rs.

CIELAB Color system created by the Committee Internationale d'Eclairage to produce a color space consisting of all visible colors. The CIELAB system, sometimes shortened to just LAB, forms the basis for most contemporary color-matching systems and lets you convert, for example, RGB images to LAB or CMYK to produce accurate color matching.

Clipping Loss of image information in a region of a photograph that is brighter than the imaging device can handle or that is outside the color gamut of the space used to represent the photograph.

CMOS Complementary metal-oxide semiconductor. An alternative to the CCD (charge-coupled device) imaging chips used by some digital cameras. The CMOS chip is simpler to manufacture, so it costs less. It also uses less power than CCD chips do, so it doesn't drain batteries as fast. The downside is that the chip does not perform as well as CCD imagers under low-light conditions, but recent digital SLR models are said to have improved performance under less-than-ideal lighting conditions.

CMS Color-management system. Software that helps produce an accurate reproduction of your original color photograph. A good CMS includes calibration and characterization aspects and is (mostly) software based. CMS is used to match the color that

you see on your monitor to the color from any output device, such as a printer, so that what you see on the screen is what you get as output. You might think of this as the last step in the WYSIWYG (What You See Is What You Get) process.

CMYK Cyan, Magenta, Yellow, and Black. For magazine reproduction, an image is separated into varying percentages of these four colors, which is why CMYK film output is called separations. Ink-jet printers also use CMYK pigments and dyes to produce photographic-quality prints.

Color depth Sometimes called "bit depth." Measures the number of bits of information that a pixel can store and ultimately determines how many colors can be displayed at one time on your monitor. Color depth is also used to describe the specifications of devices such as scanners and digital cameras, as well as a characteristic of an image file.

ColorSync Apple's color-management system (CMS). ColorSync uses a reference color space based on the way humans see colors. The heart of the system is a set of device profiles that describe what color in that reference space corresponds to the RGB or CMYK values sent to an output device. ColorSync can predict the color you'll see when you send a set of RGB values to a monitor, or CMYK values to a printer, and will automatically adjust those values so you'll see the same color on both devices—or as close as possible within the limits of the devices.

Compression Method of removing unneeded data to make a file smaller without losing any critical data—or, in the case of a photographic file, image quality.

CPU Central processing unit. Powers your computer, although many cameras and lenses also have built-in CPU chips. Digital imagers need to have enough computing power to handle the kind, and especially size, of the images they capture. Wildlife or sports photography may be possible with a 50mm lens, but the photographic experience will be much better—and less frustrating—when armed with a 400 or 800mm lens. Similarly, choosing the right computer is first a matter of finding one with enough power to process digital images fast enough to minimize frustration, and then to expedite creativity by processing that data as quickly as possible.

CPXe Common Picture eXchange Environment. A new standard for distributing photos over the Internet for photofinishing. Created by a consortium of companies including Eastman Kodak, Fujifilm, Hewlett-Packard, and others.

Device resolution Number of dots per inch (dpi) that a computer device, such as a monitor or printer, can produce.

DVD Digital video disc. Unlike the 600+MB capacity of CD-ROM discs, a DVD can store 4.7GB or more on a single disc that is the same physical size. Although competing formats exists for writable DVDs, this has not stopped a number of companies from installing writable-DVD drives in computers or offering them as external peripherals. It is just a matter of time before the DVD format replaces all disc-based data media, including CD-ROM and music CDs too.

Dynamic range Can be interpreted as the range of f-stops that can be captured from a print or slide. Rated on a scale from zero to 4—where 0 is a clean white and 4 is total black. Photographers may recognize these as the zones that Ansel Adams called Zones IX and 0 in his Zone System. The maximum- and minimum-density values capable of being captured by a specific scanner are sometimes called dMax and dMin. If a scanner's dMin were 0.3 and its dMax were 3.5, its dynamic range would be 3.2.

EI Exposure index. The rating at which a photographer actually exposes a specific kind of film, therefore deliberately underexposing or overexposing it. This is accomplished by changing the camera or handheld meter's ISO film speed to reflect a number different from that recommended by the manufacturer.

E-TTL Evaluative Through-the-Lens flash-exposure metering used by Canon EOS film and digital cameras.

EV Exposure value. Numeric value to describe the exposure where a variety of shutter speed/aperture combinations produce the same exposure with a constant film speed. For example, 1/250s + f/2.0 = 1/125s + f/2.8 = 1/60s + f/4.0 = 1/30s + f/5.6 = 1/15s + f/8.0, and so on. (This is different from the exposure index.)

FAQ Frequently Asked Questions. Term found on Internet home pages, leading you to an area containing answers to questions that visitors to the Web site might have.

Fractal Graphics term originally defined by mathematician Benoit Mandelbrot to describe a category of geometric shapes characterized by an irregularity in shape and design. Used by computer software, such as Lizard Tech's Genuine Fractals (www.lizardtech.com), as a mathematical model for resizing and enlarging image files.

Gamma Measurement of the contrast that affects mid-tones in an image. One of the differences between Mac OS and Microsoft Windows operating systems is that they have different basic Gamma settings. For a Windows computer, it's 2.2, whereas Gamma is 1.8 on a Mac OS computer—which is why images that look fine on a Mac appear darker on a Windows computer.

Gamut Range of colors that a printer, monitor, or other computer peripheral can accurately reproduce. Every device from every manufacturer has a unique gamut. If you find that the output of your color printer doesn't match what you see on your screen, you are beginning to understand the need for color management. The image may be "in gamut" for the monitor, but not for the printer.

Gaussian Blur Adobe Photoshop's filter gets its name from the fact that this filter maps pixel color values according to a Gaussian curve. A Gaussian curve is typically used to represent a normal or statistically probable outcome for a random distribution of events and is often shown as a bell-shaped curve.

GIF (pronounced like the peanut butter) Graphics Interchange Format. A compressed-image-file format that was originally developed by CompuServe Information Systems (www.cis.com) and is platform independent. The same bitmapped file created on a Macintosh is readable by a Windows graphics program.

Gigabyte One billion bytes or (more correctly) 1,024 megabytes.

Grayscale Series of gray tones ranging from white to pure black. The more shades or levels of gray, the more accurately an image will look like a full-toned black-and-white photograph. Most scanners will scan from 16 to 256 gray tones. A grayscale image file is typically one-third the size of a color one.

GUI Graphical User Interface.

HDR High Dynamic Range. A photograph's dynamic range is the ratio of contrast, tonal range, or density between black and white, and can literally be interpreted as the range of f-stops that can be captured, from a clean white to total black. Some photographers may recognize these tonal areas as what Ansel Adams's Zone System calls Zones IX and 0. The concept behind HDR is the ability to use a technique that can create an image whose overall tone values match the luminance of what the human eye records—not what a computer screen or print reproduces. Luminance is the brightness or grayscale level of a color. Together with chromaticity, luminance defines a perceived color.

ICC International Color Consortium. Group of eight large manufacturers in the computer and digital imaging industries. The consortium works to advance cross-platform color communications and has established base-level standards and protocols, in the form of ICC Profile Format specifications, to build a common foundation for communication of color information.

Icon One of those little "pictures" that represent files and programs. Used by Graphical User Interfaces (GUIs) for operating systems such as the Mac OS or Microsoft Windows.

IDE Integrated Drive Electronics. Computers accept several kinds of circuit boards to control hard disks. The most common standard was originally called IDE, but the more commonly used current term is ATA (Advanced Technology Attachment).

IEEE Institute of Electrical and Electronics Engineers. Organization that's involved in setting standards for computers and data communications, such as the popular IEEE 1394 (a.k.a. Apple's FireWire, a.k.a. Sony's i.LINK).

Imagebase Visual database program that keeps track of digital photographs, video clips, graphics files, and even sounds.

Image-editing program Broad term for software that allows digital photographs to be manipulated and enhanced in order to improve and change images, much as you would produce similar effects in a traditional darkroom—and then some.

Indexed color To keep GIF file sizes small, the format's designers limited the number of colors to 256 and created a palette of those colors; each image using the format draws from that palette. There are two kinds of indexed-color images: those that have a limited number of colors and pseudocolor images. Pseudocolor images are really grayscale images that take variations in gray levels and display those variations in colors rather than in shades of gray. Pseudocolors are typically used for scientific and technical work.

Initialize To set all values on a hard disk, removable media, or floppy disk to zero; in other words, to erase all the data that's currently stored.

Ink-jet Printer that works by spraying tiny streams of quick-drying ink onto paper to produce high-quality output. Circuits controlled by electrical impulse or heat determine exactly how much ink—and what color—to spray. This creates a series of dots that form a printed photograph.

Input (verb, noun) Information entered via keyboard or other peripheral device. Data entered into a computer is said to have been inputted. A photograph scanned into an image-enhancement program is inputted into it.

Input device Any computer peripheral—such as a keyboard, memory-card reader, or scanner—that converts analog data into digital information that can, in turn, be handled by your computer.

Integrated circuit Self-contained electronic device found in a single semiconductor computer chip.

Interface The "real-world" connection between hardware, software, and users. This is the operating system's method for directly communicating with you. It's also any mechanical or electrical link connecting two or more pieces of computer hardware.

Interlaced Broadcast television uses an interlaced signal and the NTSC (National Television Standards Committee) standard is 525 scanning lines, which means the signal refreshes the screen every second line 60 times a second and then goes back to the top of the screen and refreshes the other set of lines, again at 60 times a second. The average noninterlaced computer monitor refreshes its entire screen 60 to 72 times a second, but better ones refresh the screen at higher rates. Anything over 70 Hz considered flicker free.

Internet address The format for addressing a message to any Internet user is recipient@location.domain. The recipient is the person's name or "handle," the location is the place where the recipient can be found and the suffix tells the kind of organization to which the address belongs. Locations outside the United States have an additional extension identifying their country.

Interpolated resolution Scanners are measured by their optical as well their interpolated resolution. Optical resolution refers to the raw resolution that's inherently produced by the hardware, whereas interpolated resolution is software that adds pixels to simulate higher resolution.

IS Image Stabilization on Canon EOS lenses. This is called VR (Vibration Reduction) on Nikon lenses. Konica Minolta, on the other hand, builds its Anti-Shake technology into the camera's body.

ISO (1) International Organization for Standardization. Founded in 1946 with headquarters in Geneva, Switzerland, the ISO sets international standards for many fields. (2) Film speed and equivalents (in digital cameras) are usually referred to by their ISO speed rating, which measures light sensitivity. The higher the ISO number, the greater the light sensitivity.

ISP Internet service provider.

JPEG Joint Photographic Experts Group. JPEG was designed to discard information the eye cannot normally see and uses compression technology that breaks an image into discrete blocks of pixels, which are then divided in half until a compression ratio of from 10:1 to 100:1 is achieved. The greater the

compression ratio that's produced, the greater the loss of image quality and sharpness you can expect. Unlike other compression schemes, JPEG is a "lossy" method. By comparison, LZW, compression used in file formats such as GIF, is lossless—meaning that no data is discarded during compression.

K In the computer world, K stands for 2 to the 10th power, or 1,024. A kilobyte (or KB) is, therefore, not 1,000 bytes, but rather, 1,024 bytes.

Keyword A word that identifies certain characteristics of a photograph for later searching with a photo-organizing, or imagebase, program. A good imagebase program should be able to add keywords to your photographs and then be able to search for the images that have those words associated with them.

Landscape (mode) An image orientation that places a photograph across the wider (horizontal) side of the monitor or printer.

Layer In image-enhancement programs, such as Adobe Photoshop, layers are any one of several on-screen independent levels for creating separate—but cumulative—effects for an individual photograph. Layers can be manipulated independently, and the sum of all the individual effects on each layer makes up what you see as the final image.

LZW Lempel-Ziv-Welch. A compression algorithm used by Adobe Photoshop to perform lossless compression on TIFF files.

Magneto-optical This class of removable drives uses the ability of lasers to heat material, and thus change reflectivity, to produce storage media that can be erased and reused. One of the negatives of optical drives is that writing data to optical media requires three spins. The first spin erases existing data, the second writes new data, and the third verifies that the data is there. When compared to magnetic drives, all this spinning tends to reduce performance. Typical performance specifications for magneto-optical drives are seek times of 30 ms, access time of 40 ms, and average write transfer rate of 0.44 second. The drives are more expensive than magnetic drives, although the media is less so. Just as with their magnetic competitors, manufacturers have yet to standardize on a single magneto-optical format.

Mask Many image-enhancement programs have the ability to create masks—or stencils—that are placed over the original image to protect parts of it and to allow other sections to be edited or enhanced. Cutouts or openings in the mask make the unmasked portions of the image accessible for manipulation while the mask protects the rest.

Megabyte When you combine 1,024 kilobytes, you have a megabyte (MB), or "meg."

Metafile This graphics file type accommodates both vector and bitmapped data. More popular in the Windows environment. Apple's PICT format is also a metafile.

Moiré (pronounced "mwah-RAY"). Pattern that is an optical illusion caused by a conflict with the way the dots in an image are scanned and then printed. A single-pass scanner is all that most people require for scanning an original photograph, but when scanning printed material, a three-pass scan (one each for red, green, and blue) will almost always remove the inevitable moiré, or dot pattern.

MTF Modulation Transfer Function curves show how much contrast is retained by a lens in a given image point. For example, 0.9 means that 90 percent of the original scene's contrast was retained.

Multizone metering Through-the-Lens metering where the exposure is measured by several metering cells, depending on the subject distance.

Nano- Prefix that means one-billionth.

ND filter Neutral-density filters are rated by how many f-stops they decrease your lens-aperature setting. An ND filter lets you control an image when the stated combination of film speed, lens aperture, and shutter speeds won't let you produce the effect you're attempting to produce.

NTSC National Television Standards Committee. NTSC sets the standards that apply to television and video playback on resolution, speed, and color. All television sets in the United States (and Japan too) follow the NTSC standard and videotape and other forms of video display (such as games) meet NTSC standards.

PCX Not an acronym, but rather a bitmapped file format originally developed for the Windows program PC Paintbrush. Most Windows graphics programs read and write PCX files.

PDF Portable Document Format. A standard file format invented by Adobe Systems. PDF allows people to send graphics files that include text and graphics. Using the free Adobe Reader software, these files can then be read by the recipient, exactly as the files were created. You can download free Mac OS, Windows, and UNIX versions of Acrobat Reader from www.adobe.com.

Photo CD Kodak's proprietary digitizing process stores photographs onto a CD-ROM disc. The Photo CD process can digitize images from color slides and black-and-white or color

negatives and a Master Disc can store up to 100 high-resolution images from 35mm film. Images are stored in five different file sizes and five different resolutions.

PICT Another acronym without a strict definition, this time for a metafile file format for the Mac OS. As a metafile, PICT files contain both bitmapped and vector information.

Picture CD A Kodak process that converts film-based images into digital files, using the JPEG format, and places the photos on a CD-ROM. This service can be ordered when you have your film processed by camera stores and other retail outlets. Their images are returned to consumers as traditional prints and on a Picture CD as digital files that can be viewed, enhanced, printed, or e-mailed.

Piezoelectric The property of some crystals that oscillate when subjected to electrical voltage. A form of print-head design that is used by Epson in their Stylus Color family of ink-jet printers. Piezoelectric technology generates electricity when applying mechanical stress.

Pixel Acronym for picture element. A computer's screen is made up of thousands of these colored dots of light that, when combined, produce a photographic image. A digital photograph's resolution, or visual quality, is determined by the width and height of the image as measured in pixels.

PMT Photomultiplier tube. A type of sensing technology used in drum scanners.

PNG (pronounced "ping") Portable Network Graphics. This successor to the GIF format was created by a coalition of independent graphics developers to design a new, royalty-free graphics file format. Not many people use it, though.

PostScript A programming language created by Adobe Systems that defines all of the shapes in a file as outlines and interprets these outlines by mathematical formulas called Bezier curves. Any PostScript-compatible output device uses those definitions to reproduce the image on your computer screen.

PPI Pixels per inch.

Profile A small file that gives your monitor (or any other device) data that associates each number with a measured color based on specifications created by the International Color Consortium (www.icc.org). When your computer communicates color information, it not only transmits numerical data, but also specifies how those numbers should appear. Color-managed software (the next step) can then take this profile into consideration and adjust the device accordingly.

RAM Random-access memory. RAM is that part of your computer that temporarily stores all data while you are working on an image or a letter to Granny. Unlike data stored on a hard drive, this data is volatile. If you lose power or turn off your computer, the information disappears. Most computer motherboards feature several raised metal and plastic slots that hold a RAM chip in the form of DIMMs (Dual In-Line Memory Modules). The more RAM you have, the better it is for digital imaging work, but there are economic considerations too. As I write this, RAM is inexpensive, but prices can fluctuate.

Resolution A digital photograph's resolution, or image quality, is measured by the image's width and height as measured in pixels. When a slide or negative is converted from silver grain into pixels, the resulting digital image can be made at different resolutions. The higher the resolution of an image—the more pixels it has—the better the visual quality. An image with a resolution of 2048 × 3072 pixels has better resolution and more photographic quality than the same image digitized at 128 × 192 pixels.

RGB Red, Green, Blue. Color monitors use red, green, and blue signals to produce all the colors that you see on the screen. The concept is built around how these three colors of light blend together to produce all visible colors.

RIP Raster image processor. A process that prepares image data for the screen or printer.

ROM Read-only memory. The memory in your computer from which you can only read data. It's a one-way street.

Saturation Often referred to as chroma. A measurement of the amount of gray present in a color.

Search engine Because the actual number of Web sites on the World Wide Web is big and getting bigger every day, finding the Exacta Collectors home page (www.ihagee.org) might be impossible without a way to search for the word "Exacta." That's the function of search engines: you type in a word or words and a list of Web sites whose descriptions contain those keywords appears.

Selection tool One of the most important tools found in an image-enhancement program. Selection tools allow you to highlight or select portions of an image that will have an effect applied to them.

Serial port On the back of a computer, an outlet that is used to connect peripheral devices such as modems and printers. The serial port sends and receives data 1 bit at a time.

Shareware A creative way of distributing software that lets you try a program for up to 30 days before you're expected to pay for it.

SLR Single-lens reflex. In an SLR camera, the image created by the lens is transmitted to the viewfinder via a mirror, and the viewfinder image corresponds to the actual image area.

sRGB Standard RGB (Red, Green, and Blue) is an RGB color space that was originally created by Hewlett-Packard and Microsoft Corporation. sRGB defines the red, green, and blue primaries as colors where one of the three channels is at the maximum value and the other two are at zero. The sRGB color space is designed to match typical home and office viewing conditions, rather than the darker environment typically used for commercial color matching. sRGB is sometimes avoided by publishing professionals because its color gamut is not big enough, especially in the blue-green colors, to include all the colors that can be reproduced in CMYK printing.

Thumbnail An old design-industry term for "small sketch." In the world of digital photography, thumbnails are small, low-resolution versions of your original image.

TIFF Tagged Image File Format is a bitmapped file format that can be any resolution and includes black-and-white or color images. TIFFs are supposed to be platform-independent files, so files created on your Macintosh can (almost) always be read by any Windows graphics program.

Transfer rate A measurement of the average number of bytes per unit of time passing between disk storage and processor storage.

TTL Through-the-Lens. In this system, the camera measures the actual light entering the lens.

TWAIN Not an acronym, although some pundits insist it stands for "Technology Without An Interesting Name." A hardware/software standard that allows users to access scanners and other hardware peripherals from inside Windows applications, although the TWAIN standard can be found on Mac OS computers too.

UDMA Ultra Direct Memory Access. This is actually a hard-disk standard that allows certain hardware subsystems within the computer (or digital SLR) to access system memory for reading and/or writing independently of the central processing unit. Computers and cameras that have DMA channels can transfer data to and from devices with much less CPU overhead than can computers without a DMA channel.

Undo One of the most useful tools, commands, and/or features an image-enhancement program can have. It lets you

go back to the way the image was before you made the last change.

UNIX A multiuser, multitasking (doing more than one thing at the same time), multiplatform operating system originally developed by Bell Labs for mainframes and minicomputers back in the bad old days of computing.

Unsharp Mask In Adobe Photoshop and other image-editing programs, this is a digital implementation of a traditional darkroom technique where a blurred film negative is combined with the original to highlight the photograph's edges. In digital form, it's a controllable method for sharpening an image.

URL Uniform Resource Locator. That's how you find a Web site (www.joefaraceshootscars.com, for example) when using an Internet browser.

Variations A command found in Adobe Photoshop that gives you control over the hue and color intensity of an image.

Vector Images saved in this format are stored as points, lines, and mathematical formulas that describe the shapes making up that image. When vector files are viewed on your computer screen or printed, the formulas are converted into a dot or pixel pattern. Because these pixels are not part of the file itself, the image can be resized without losing any quality.

Virtual memory Sometimes called (by Adobe in Photoshop) a "scratch disk." When not enough "real" memory is available, this process borrows a chunk of your hard disk to store data and perform imaging calculations.

VRAM Video random-access memory.

WMF Windows Metafile Format. A vector-graphics format designed to be portable from one PC-based program to another.

WORM Write Once Read Many. A type of data-drive recording method.

Worm A form of computer virus that continually duplicates itself on your hard disk, gradually using all of your computer's resources before ultimately shutting it down.

WYSIWYG (pronounced "wissy-wig") What You See Is What You Get. This term refers to the ability to view text and graphics on-screen in the same way they will appear when printed.

Xaos Tools (pronounced "chaos") A software company that offers several packages of Adobe Photoshop–compatible plug-ins that can produce artistic-looking images.

YCC The color model used by Kodak in its Photo CD process. This involves the translation of data that was originally in RGB form into one part of what scientists call “luminance” but the rest of us call brightness—this is the Y component. The format includes two parts—the CC components—of chrominance and color or hue.

ZFP Zero Footprint.

Zip Iomega’s Zip removable-media drive that has a cartridge that looks like a fat floppy disk and uses a combination of conventional hard-disk read/write heads with flexible disks. Zip disks are available in two capacities, 100MB and 250MB, and have long since been replaced by CDs and DVDs.

Zoom Tool found in most image-enhancement programs that lets you zoom into any photograph by clicking your mouse button. The Zoom tool is so often depicted by a magnifying-glass icon that the tool itself is often just called “magnifying glass.” Zoom also describes a type of lens with more than one focal length.

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